THE JOURNAL OF GAS LIGHTING
WATER SUPPLY & SANITARY IMPROVEMENT

VOL. LXXV. No. 1919.] LONDON, FEBRUARY 20, 1900. [52ND YEAR. PRICE 6d.

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Yield of Gas per Ton . . 10,500 Cubic Feet.
Illuminating Power . . . 16·4 Candles.
Coke . . . . . 68 per Cent.

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Rich in Illuminating Power and Yield of Gas.
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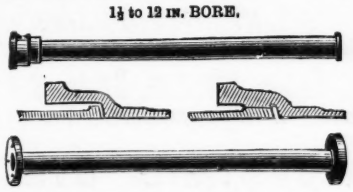

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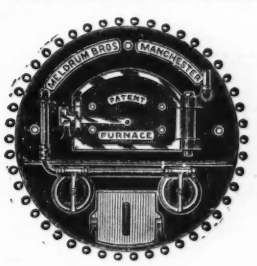

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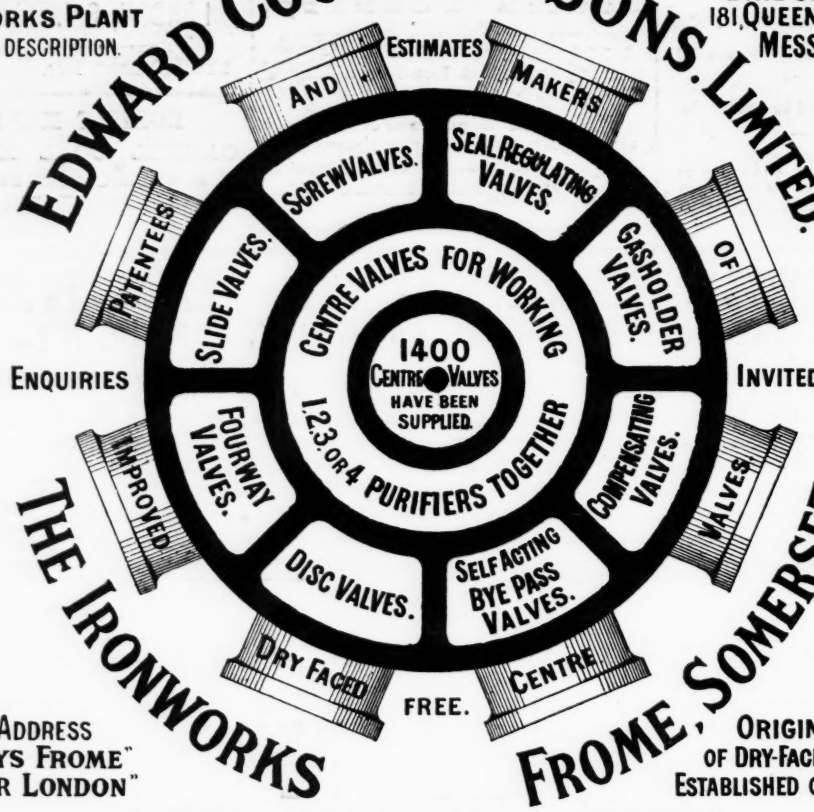

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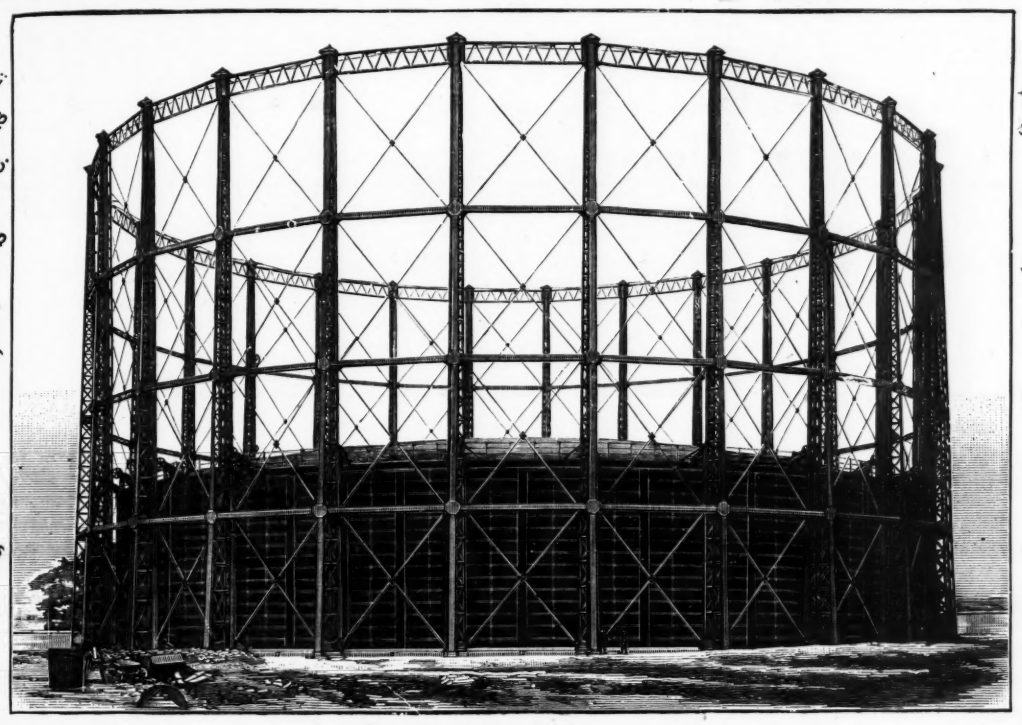

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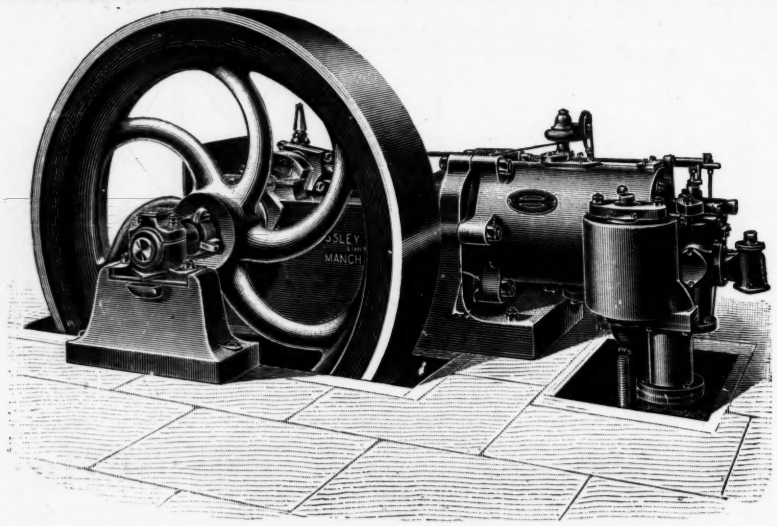

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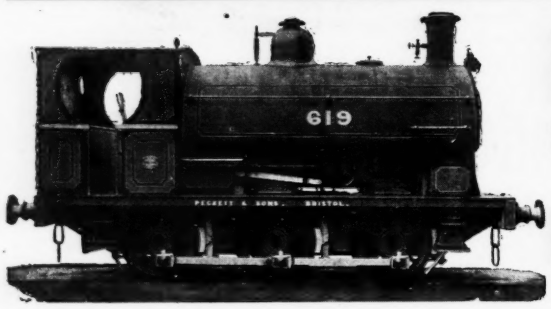

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PURIFIERS with Planed Joints a Speciality.

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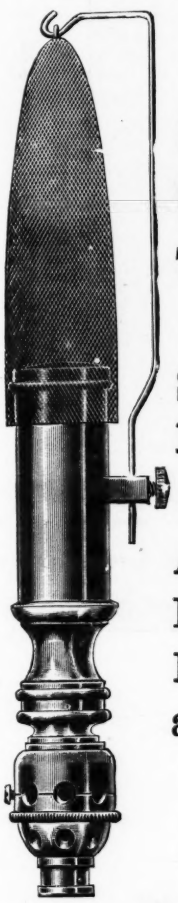
GASHOLDERS, Cast-Iron or Steel Tanks.

DESIGNS, SPECIFICATIONS, and ESTIMATES FREE.

PIG IRON (Special Quality) for Engine Cylinders, GAS COAL famous for its UNRIVALLED EXCELLENCE.

THE

INTENSIFIED GAS LIGHT COMPANY, LTD.



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300 CANDLES PER BURNER

Three Burners consuming 30 cubic feet per hour give a Light of 1000-Candle Power at half the cost of Electric Light.

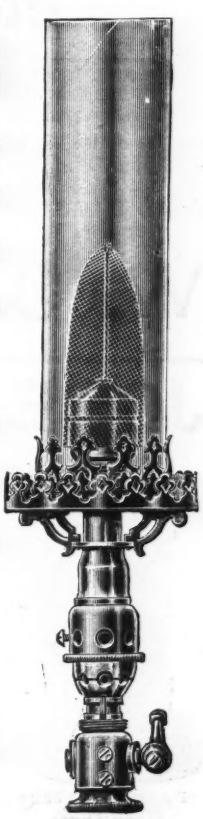
Specially adapted for Lighting Railway Stations, Docks, Sheds, Workshops, Streets and Squares, Shop Windows, &c., &c.

Adopted by the L. & N.W. and Great Central Railways at their Euston and Marylebone Termini, the Crystal Palace, London Pavilion, Mersey and Leith Dock and Harbour Boards, Edinburgh and Leeds Gas Committees, &c., &c., &c.

Specially Low Terms to Gas Companies for Trial Installations.

"The perfection of artificial lighting on the large scale."—"*Journal of Gas Lighting*," April 18, 1899.

ORDINARY GAS PRESSURE PATENTS



The Intensified Company's Improved Incandescent Burner gives **25 CANDLES PER FOOT**, or 60 Candles for $2\frac{1}{2}$ feet. No other Burner on the Market can compare with this. Price, with Mantle and Chimney, from 6s. 6d. Send for Complete Lists.

The most Effective and Economical Burner on the Market for both Indoor and Outdoor Lighting. Mantles specially manufactured for the Company, for both Systems, by the Welsbach Incandescent Gas-Light Company.

For full Particulars apply to the Company's Works—

3, WILSON ST., DRURY LANE,

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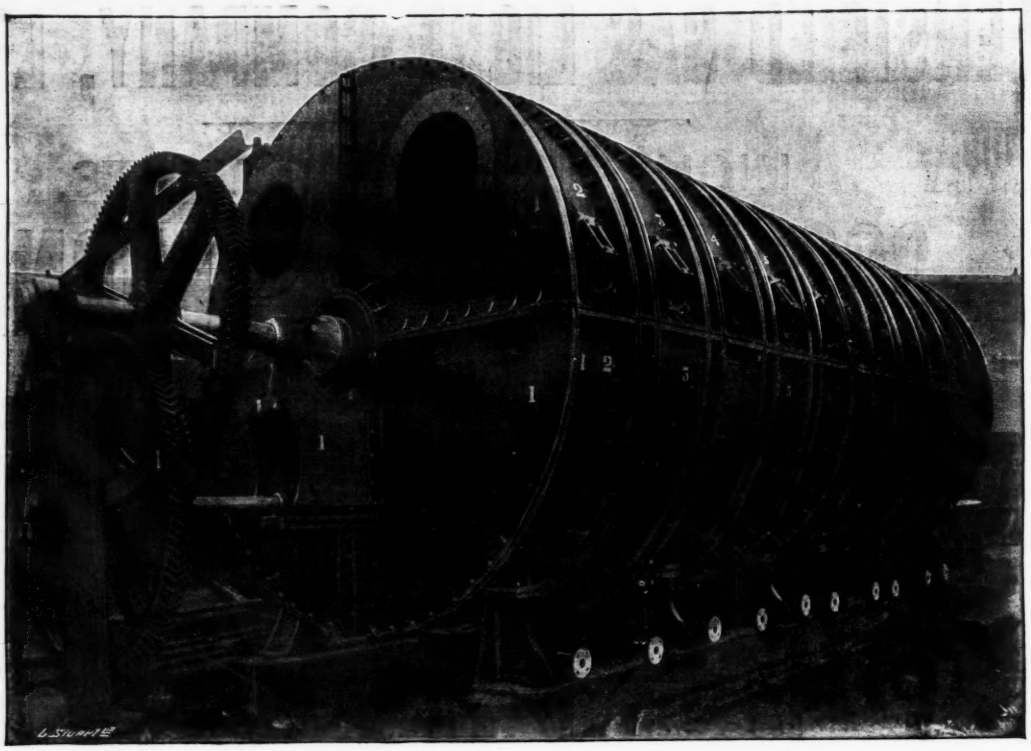
PATENT "NEW" SCRUBBER-WASHER

RESULTS GUARANTEED.



RESULTS GUARANTEED.

Photo. of Machine recently erected at Gaythorn Gas-Works, Manchester.

NOTE: Orders already received in

1900

For MACHINES to deal with

21,000,000

CUBIC FEET OF GAS PER DIEM.

[*Extract from Paper by* Mr. T. N. RITSON, Assoc.M.Inst.C.E., of Kendal, *read before the* MANCHESTER DISTRICT INSTITUTION OF GAS ENGINEERS, *June* 3, 1899.]

"A HOLMES' PATENT ROTARY 'NEW' WASHER-SCRUBBER was erected in the autumn of 1895, and is capable of dealing with half-a-million cubic feet of gas per day. This washer completely purifies the gas from ammonia, with from 10 to 12 gallons of water per ton of coal carbonized, leaving only 0·3 to 0·5 grain of ammonia per 100 cubic feet of gas at the outlet. Since this machine was erected, THE YIELD OF SULPHATE OF AMMONIA HAS BEEN MORE THAN DOUBLED."—"Journal of Gas Lighting," *June* 6, 1899.

Patentees and Sole Makers:

W. C. HOLMES & CO., WORKS: **HUDDERSFIELD.**

TELEGRAMS: "IGNITOR, LONDON." "HOLMES, HUDDERSFIELD."

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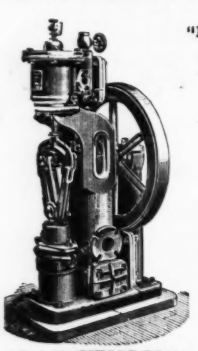

"Fig. 705. SINGLE RAM" STEAM-PUMP.

Fig. 598. "CORNISH" STEAM-PUMP FOR BOILER FEEDING, &c.

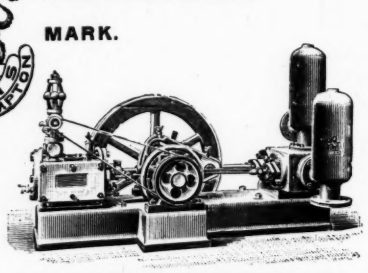

Fig. 685. "RELIABLE" STEAM-PUMP FOR TAR AND THICK FLUIDS.

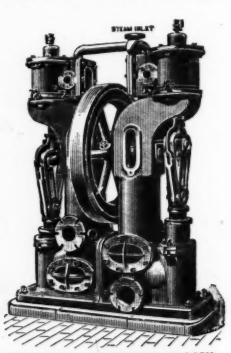

Fig. 713. "DOUBLE-RAM" STEAM-PUMP.

INCLINED RETORTS

We Undertake Contracts for Complete
Installations of **INCLINED RETORT-BENCHES,**
with all the Latest Improvements,
as Erected by us at

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THE MOST SATISFACTORY INSTALLATION
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The Inlet Pressure having absolutely no effect on the open-ended cylindrical Valve, the pressure is maintained constant at the outlet **UNDER ANY CHANGE OF PRESSURE OR DRAUGHT**, and dispenses with the usual complicated balancing arrangements.

Provided with a most **SIMPLE** and **CONVENIENT METHOD** of **WATER LOADING** and **WITHDRAWAL** without syphons or other complications, or with weights to adjust pressure as desired.

WILLEY & CO.,

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Manufacturers of Gasholders, Purifiers, and every description of Gas Plant of any capacity. Station Meters, Wet and Dry Consumers' Meters, Prepayment Meters, Gas Apparatus and Gas Fittings. Also Bridges, Roofs, Columns, Girders, and Structural Iron and Steel Work of all kinds.

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WELSBACH INCANDESCENT GAS-LIGHT.

NEW WELSBACH BURNERS.

25 Candles per Cubic Foot of Gas.

This is the Burner exhibited at Niagara Hall, London, and throughout the Provinces.

The New Welsbach Burner is used without a Chimney.

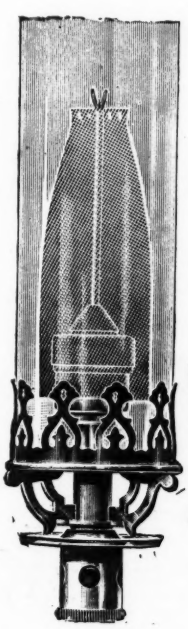
Suitable for Indoor and Outdoor Lighting.

Supplied in SIX Sizes,

Consuming from $\frac{3}{4}$ to 7 Cubic Feet of Gas per Hour.

Price from 5/- upwards.

MANTLES from 9d. each.

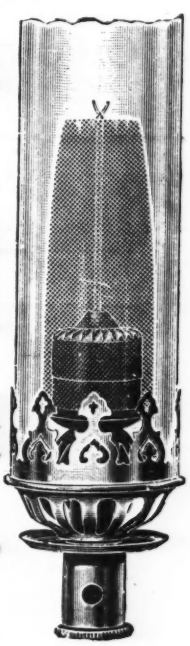


"C" WELSBACH BURNER.

REDUCED PRICES.

"C" Ordinary Burner, 5s. 0d.

"C" Bye-Pass Burner, 6s. 6d.



THE "YORK" WELSBACH BURNER

A CHEAP FORM OF THE "C" BURNER.

50 to 60 Candle Power with $3\frac{1}{2}$ to $3\frac{3}{4}$ Cubic Feet of Gas,

Price complete with MANTLE and CHIMNEY, **4/-.**

MANTLES FOR "YORK" BURNER, **1/-** EACH.

ALL THE ABOVE PATTERNS CAN NOW BE SUPPLIED.

Complete Price List on Application.

The Welsbach Incandescent Gas-Light Co., Ltd.,

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FRANK WRIGHT'S

PREPAYMENT GAS-METER CORPORATION, LIMITED,

Dry Gas-Meter Manufacturers.

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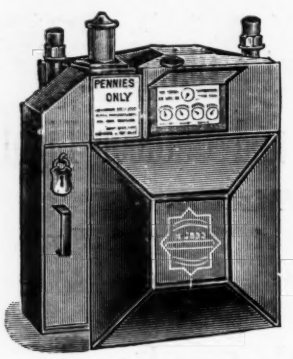

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1. **IS AUTOMATIC.**
2. Simplicity of Mechanism.
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4. Impossibility of being Tampered with.
5. Unaffected by Bent or Battered Coins.
6. Extra large Money-Box.
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Guaranteed for Five Years.

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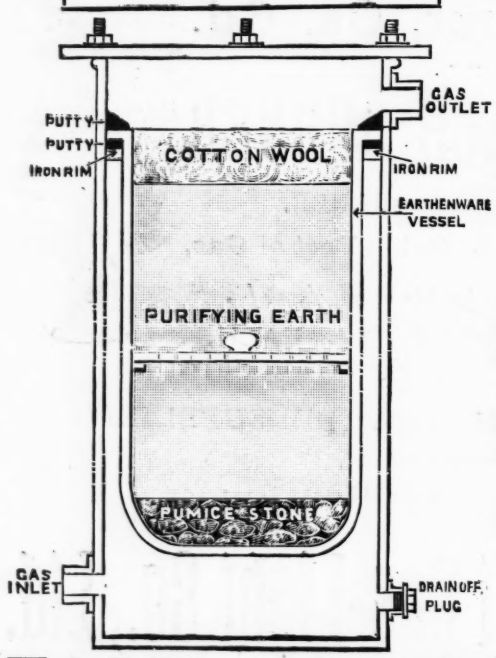
FRANKS' PATENT ACETYLENE PURIFIER.

GOLD MEDAL, BUDAPEST, 1899.



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The only perfect System of Purifying Acetylene, and rendering it serviceable for Domestic Lighting **without reducing the Illuminating Power.**

Can be attached to any existing Generator.

Removes all **Phosphuretted Hydrogen, Sulphuretted Hydrogen, Ammonia,** and other **Impurities.**

Prevents Carbonizing and **Choking of the Burners**; also **Noxious Products of Combustion** and Haze in Rooms.

Obviates all risk of Explosion through a mixture of Gas and Air.

Full Particulars and Prices from the Manufacturers (under Licence from the Acetylene Purifying Company, Ltd.)—

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"VERITAS" LAMP WORKS,

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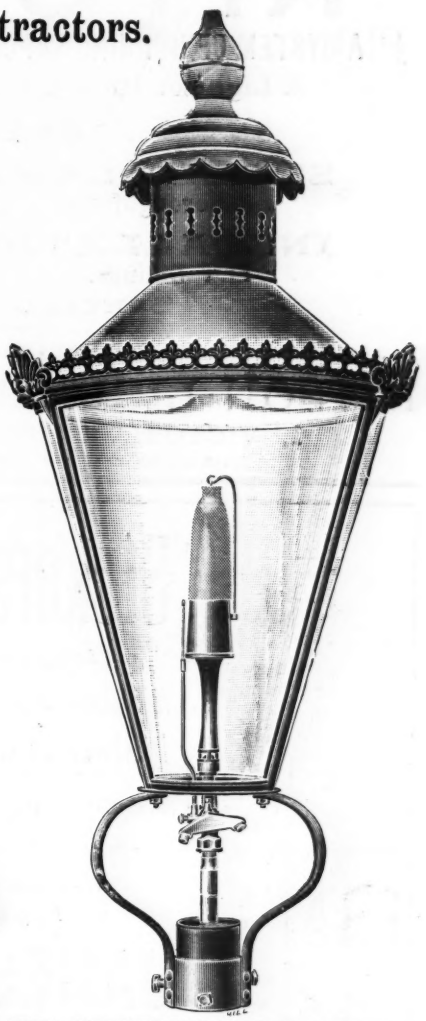
Gas Engineers & Lighting Contractors.

THE "LONDON" CYLINDER LANTERN.

THE "BEACON" GLOBE LAMP.

As fitted at London Bridge near Railway Approach; three Lamps giving the Illuminating Power of 603 Candles. See Surveyor's Report as published in the "*JOURNAL*" for Jan. 10, 1899.



THE 'PLYMOUTH" CYLINDER LANTERN.

THE "ST. ALBANS."
Fitted with Steel Enamelled White Reflector.

The right-hand Illustration shows a 14-inch Lantern Fitted with Enamelled Deflector, &c. By using this simple adaptation, existing lamps with some further years of use in them are converted to a smart up-to-date Lantern, and, with the addition of the No. 2 or "C" Welsbach Burner, it supplies a much needed want with a very small outlay.

This adaptation divides the incoming cold air from the outgoing products of combustion, and forms the lamp into a double chamber lantern.

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TELEPHONE 1215 HOLBORN.

Fitted with "Talbot" Deflector and Chimney.

19, FARRINGDON ROAD, E.C.

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"KITSON" LIGHT

A SYSTEM OF BURNING VAPOURIZED PETROLEUM WITHIN AN INCANDESCENT MANTLE.

A Light of 1000-CANDLE POWER produced at a cost of less than

ONE PENNY PER HOUR.

STREET-LAMPS—Self-Contained Plant, easily fixed, no tearing up of Thoroughfares.

INSTALLATIONS for Works, Factories, Warehouses, Railway Stations, and Sidings.

SPECIAL TERMS TO GAS COMPANIES.

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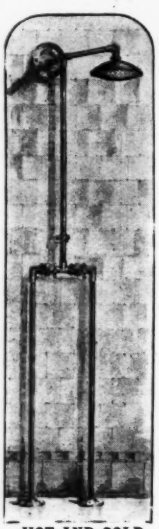

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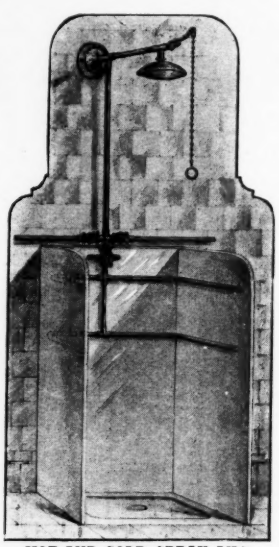

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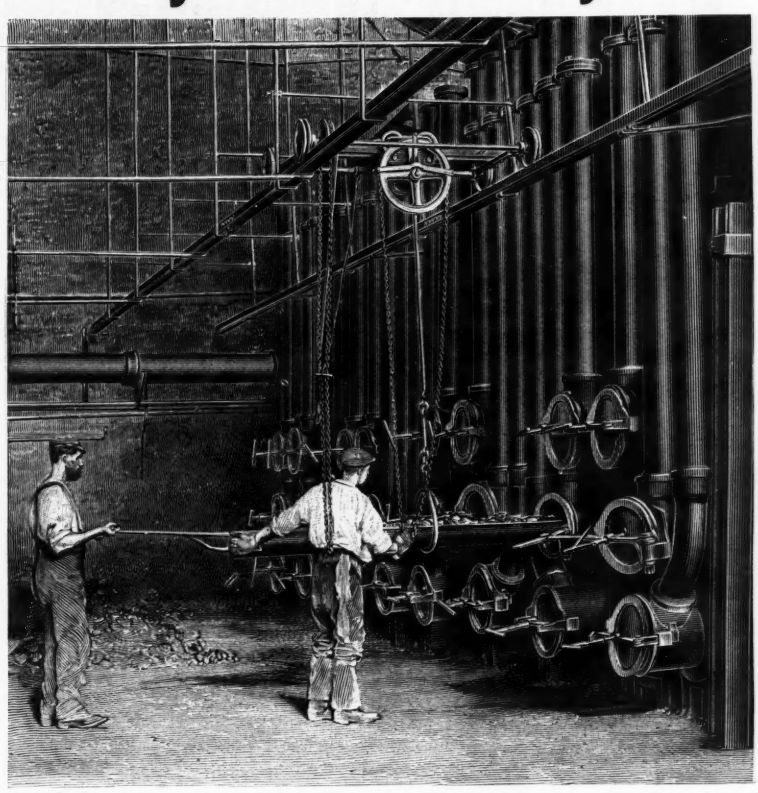

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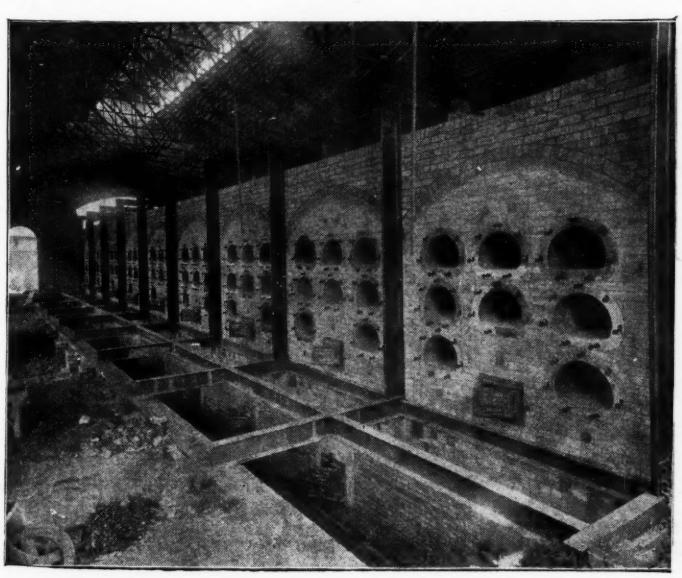

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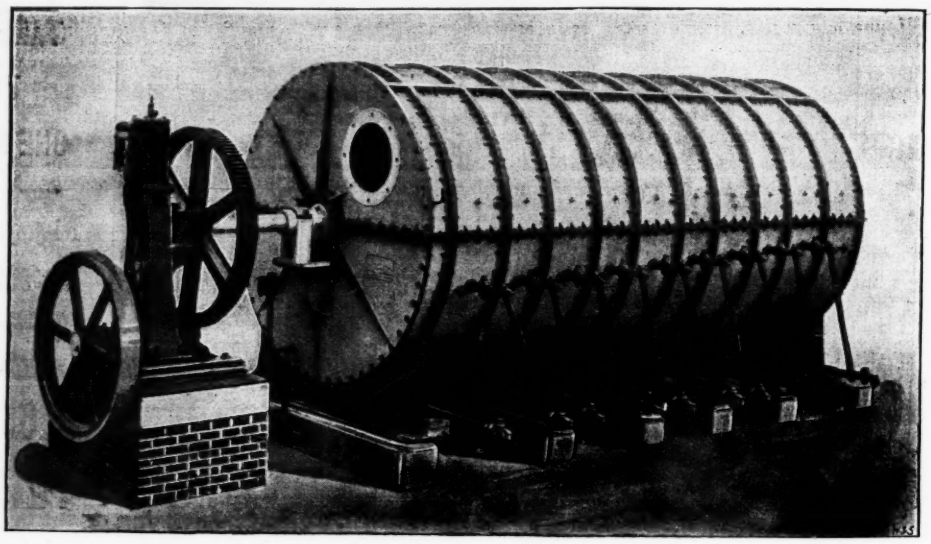

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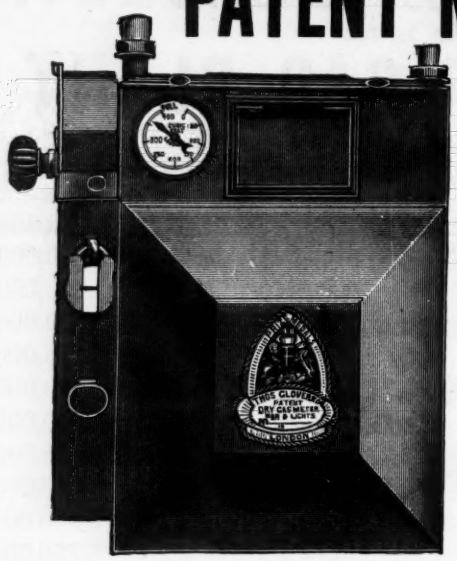

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EDITORIAL NOTES.

Mr. Livesey on South Metropolitan Gas Affairs.

THE meetings of the South Metropolitan Gas Company on Wednesday last were held for the first time in the Great Hall of the Cannon Street Hotel, and the experiment was so successful in respect of the comfort of the numerous proprietors who take an intelligent interest in the proceedings on these occasions, that it is to be hoped it will become the practice of the future. There is plenty of room in this hall; and the acoustic properties of the apartment are so good that every speaker can be heard without straining—which is a great thing when there is so much to do as was the case on Wednesday. Mr. Livesey presided; and although he set out to be brief in dealing with the report and accounts, he nevertheless found plenty of matter for a luminous exposition of the actual condition and prospects of the undertaking. He first of all laid stress upon the regularity with which all the London Gas Companies do their work and keep up the supply. This, like the daily miracle of the victualling of the great Metropolis, is by the general public taken for granted. All the same, it is a work that "takes some doing;" and, particularly during the present winter, the task of maintaining the supply of gas has not been done automatically. And yet Mr. Livesey did not utter one word of complaint against the coal people. It would have been futile; and futility is not attractive to Mr. Livesey.

From the subject of the shortage of coal, the Chairman passed to the question of finance. He showed that the Company are doing all their work for an average return to the shareholders of $3\frac{3}{4}$ per cent. This, as he remarked, is not enough for a trading concern. Mr. Livesey has often girded at the tyranny exercised upon stock quotations by the Stock Exchange; and he is always on his guard lest anything done by the South Metropolitan Board should play in any way into the hands of the magnates of Capel Court. He fully realizes, therefore, that those who have the charge of an industrial property paying only $3\frac{3}{4}$ per cent. to those investors who buy at current market values, cannot be too careful of the stability of the investment. This consideration is adduced to justify the policy of the Board in keeping in hand a margin of dividend-paying power. Besides, it is still an open question what next year's supply of coal will cost. Dear coal is compensated for, to a certain extent, by enhanced residuals. True; but it is a question of degree. An advance of a shilling or two per ton on the price of gas coals will in all probability be recouped by the coke and possibly other residuals; but when it comes to advances of 7s. a ton and more, this set-off fails to operate.

Respecting the London County Council and their portable photometer craze, Mr. Livesey was content to give this authority credit for good intentions, which, however, are not compensation for lack of knowledge. The legalization of the portable photometer would cost the South Metropolitan consumers £84,000 a year; and all for nothing. It would not, however, cost the shareholders a penny. Shareholders, in the judgment of Spring Gardens, are miscreants undeserving of the slightest sympathy. Anything that tends to diminish the profits of an undertaking must be admirable, whether it benefits the public or not. Such, at least, appears to be the doctrine favoured by the London County Council. Perhaps after they have heard from Mr. Livesey on this head, they may reconsider the photometrical question; but the chance is not a very great one.

All this led up to a really striking explanation of the reason why the price of gas in South London has been lowered by 5d. per 1000 cubic feet since 1886. It has not been in consequence of any improvement in the method of manufacture, or the cheapening of the raw materials, or anything else of a technical nature. It is simply due to the capital burden having been relieved to a corresponding amount. This passage of Mr. Livesey's address may be commended to the careful study of those who in all countries are concerned with the problem of cheap gas supply. It has often been argued in these columns how hopelessly misled were the framers of the Paris Gas Company's Treaty with the Municipality, when they pinned the hope of reduced prices to scientific and technical improvements in manufacture. These words of the head of the organization which alone has managed to bring the price of

gas in London down to 2s. 1d. per 1000 cubic feet, are as good as a treatise on this aspect of gas economics.

The Chairman's remarks on the Company's relations with their workpeople were interesting, as usual. Particularly striking was the statement regarding the way in which the Company and their men are dealing with the matter of the Reservists' families. It is most gratifying to note how the sentiment of public duty seems to thrive and bear fruit with the South Metropolitan men, while in so many cases workpeople of the same order expect everything to be done for them. The sense of free citizenship and the love of independence must be strong and lively in men who are willing to tax themselves for it. The Chairman concluded his address on the report and accounts without mentioning the proposed Nine Elms transfer.

In explaining the Company's Bill, at the Wharncliffe meeting, Mr. Livesey gave himself a free tongue, and expounded the proposed scheme of legislation in masterly style. We shall not attempt to paraphrase this speech here, as it is reported *verbatim* in the proper place. It is a contribution of extraordinary value to the contemporary literature of gas administration.

The Weather and Coal Stocks.

THE weather experienced in London and very generally throughout the country last week was exceedingly trying to the health and temper of the individual; but it must, moreover, have been in a peculiar degree trying to the resources of the Gas Companies, in view of the emptiness of their coal-stores. The severity of the spell of cold and stormy days that prevailed cut both ways against the efforts made by the gas manager to improve the situation. The days when the bitter blizzard-like snowstorms swept the country demonstrated most clearly the growing tendency of the "consumption curve" to move inversely in accordance with the temperature line; and the output has, we believe, been far in excess of the normal for the time of the year. This tendency—due, of course, to the increasing use of gas for heating purposes—has been especially marked since the high prices of coal have prevailed; and it is a satisfactory reflection for the gas manufacturer that out of the evil of the present state of the coal market the good will come, in the permanent increase which will surely follow from the stimulation of gas consumption due to temporary causes. Once the householder has overcome his initial prejudice against gas-fires, and has learned from experience their many advantages, he will continue from choice that which he has begun from necessity. At the present moment, however, this increased and increasing demand for gas is only a source of great embarrassment to the engineer who has not (and there are many engineers just now who have not) a week's coal on the works; and the situation last week was, as we have said, doubly strained by the character of the weather. The cold sent up the deliveries of gas, while the gales impeded the deliveries of coal by the considerable derangement of shipping. The gas engineer's lot is certainly not a happy one in the present year of grace! In London, the strain upon such of the works of the Chartered Company as are dependent upon barge-carried supplies must have gone dangerously near breaking-point; for during last week the coalies employed by Messrs. Cory thought fit to strike work for higher pay. The firm named, it may be explained, own the derricks in the Thames at which coal supplies, brought by steamers from the North, are transferred to the barges used to carry the coal to its destination up river—much of it going to the in-town works of the Gaslight and Coke Company. This work was, by the action of the men, who chose their time for striking only too well (from their point of view), suspended for the greater part of the week; but as the "JOURNAL" goes to press we learn that the men have resumed unloading the ships after obtaining concessions from their employers. Such incidents at such a time are particularly exasperating; but it behoves us, perhaps, to be thankful that, so far, at any rate, the coal difficulty has not been to any but the slightest extent aggravated by labour disputes. It is in itself quite sufficiently serious to occupy the attention of, and be a source of much anxiety to, the heads of the gas-making profession for many weeks to come.

The Affairs of the Crystal Palace District Company—Mr. Livesey on Oil Gas.

AT the meeting of the Crystal Palace District Gas Company on Friday, Mr. George Livesey, the Chairman of the Company, improved the occasion by delivering his mind of several pronouncements of interest and importance to the gas industry at large. He mentioned at the outset of his speech that the Trade Unions had abandoned their intended appeal to the House of Lords against the famous judgment that made picketing, when described as besetting, illegal and punishable by a fine of £20 or three months' imprisonment. Then, after an exposition of the Company's finances, the Chairman fell upon—there is no other word—the topic of the cost of making carburetted water gas. He said that in the accounts of no gas undertaking that he was acquainted with is the cost of this accessory product stated. In the case of the Crystal Palace District Company this is going to be given. "He would promise that "the gas fraternity should know exactly what the oil gas "did cost." He will be as good as his word. Of course, everybody knows what "papers" on oil-gas manufacture say on the point; but this is not always exactly mirrored in carbonizing accounts. The same criticism has been applied to the carbonizing of coal by inclined retorts. A paper may be true; but it is not necessarily the whole truth. This engagement on the part of the Chairman will cause the eyes of the gas manager everywhere to turn to the published accounts of the working of the Crystal Palace Gas Company. Mr. Shoubridge, we may be sure, will not object to this; for in his hands the works are fast being equipped with the best gas-manufacturing appliances of all kinds, and nothing will please so capable and candid an Engineer better than to show how they work in the books as well as in effect.

The Companies Acts Amendment Bill.

A CONSIDERABLE degree of public approval has been accorded to the draft Companies Acts Amendment Bill of the Government, which the President of the Board of Trade has introduced into the House of Commons. There will not be much legislation of a general character this session, for obvious reasons; but the scandal of fraudulent company promotion has attained to such proportions, that there ought not to be any great parliamentary difficulty in the way of dealing fairly, yet stringently, with this particular Sin of the City. The part taken by members of Parliament in company-mongering should alone ensure the acceptance by the Legislature as a whole, of any well-considered means of restoring the principle of joint-stock trading to its original standing and purpose. The Government Bill certainly does not err in attempting to do too much. A good deal of the Bill is designed merely to ensure that existing forms and requirements shall have the validity, and operate to the end, ostensibly assigned to them by the Acts, but open to evasion in practice. The trickery of making illusory appointments to the Board of a Company is to be stopped by requiring a written consent of every person so named to be filed with the Registrar, together with a contract to take and pay for his qualification. A clause also prescribes the conditions under which Companies may go to allotment. The minimum amount of subscription upon which the Directors may proceed to allotment is to be fixed by the Memorandum or Articles of Association, and stated in the prospectus. If no amount is named, then it must be the whole amount of the share capital. If the conditions are not complied with, all deposits are to be returned within forty days. Important restrictions are to be imposed on Companies commencing business, to ensure their possession of the right amount of capital and the proper qualification of the Directors. All prospectuses are to be dated, and a copy signed (for filing) by every Director named therein. Prospectuses are to disclose all sorts of facts, including the particulars of all agreements with vendors. An attempt is made to void the well-known "waiver clause," and to prevent the alteration of the terms of any contract mentioned in the prospectus except in general meeting. The statutory meeting is to be held within three months after a report on the condition of the Company signed by two Directors has been supplied to every shareholder. All mortgages and charges created by the Company are to be registered within seven days. The register is to be open to inspection. Lastly, any person who makes a false return, report, or entry in a balance-sheet or other statutory document renders himself liable to imprisonment for four months, and a fine of £100. There does not appear to be anything in the Bill to discourage honest and suitable persons from becoming Directors of public

Companies—a consideration always raised as a bugbear to frighten reformers of the existing system—because every person so acting is made responsible only for his own proceedings. The point is, however, that the Bill is intended to make this personal responsibility clear, positive, and not to be escaped from by any means. It is deliberately intended to make the way of the "guinea pig" and the blood-sucking Director hard; and although specimens of these species of Directors exist in Parliament, they are marked men, and as such dare not stand in the path of reform. The chief danger to the Bill will come from the philosophic lawyers.

Welsbach v. Sunlight—The Patent of 1886.

ANOTHER round has been fought in the campaign between the Welsbach and Sunlight Companies. This is a struggle which threatens to "eternalize" itself, as the French say; and which lookers-on find tedious and vexatious to the last degree. The ordinary man cannot fail to be impressed by the circumstance that this incandescent gas-light litigation seems to go on irrespective of the life and merit of the patent involved in each case. The previous victory of the Welsbach Company was only completed after their original patent had expired, and their then opponents had gone into liquidation. Now the battle has raged over a patent which is not actually expired, but will lapse next month. This is Welsbach's 1886 patent, which protected the use of thoria in mantle manufacture. It was alleged that the defendants had taken this substance for making their mantles, and had thus infringed the plaintiffs' patent. The action was chiefly fought between Counsel—only sufficient evidence being taken to place the facts on record. In the event, the Judge decided that there had been infringement, and gave judgment for the plaintiffs, the Welsbach Company, with an inquiry as to damages, an order for the delivering up of the infringing mantles, and costs. The legal consequences of these actions, and even the manner in which they are carried on, are affected by the reconstructions which both the Welsbach and the Sunlight interests have undergone. We cannot indulge in any reflections upon the case in point, because it has been promptly appealed; and where it will end no man knows. It used to be said in the legal profession that every respectable lawsuit ought to go up to the House of Lords before it eventually died. Our readers must bear in mind, also, that there is yet another action pending between the same parties which will probably possess more importance for incandescent gas lighting at large than any suit of the kind since the original Welsbach master-patent was vindicated. One hesitates to say in respect of any incandescent gas-light action that it is of critical value; but the coming tussle will at any rate settle or unsettle the monopoly of the manufacture of mantles, as now made by the Welsbach Company under a patent which expires in 1907. This is something worth fighting for. Our special report of the hearing before Mr. Justice Buckley is interesting reading. The most satisfactory feature of the proceedings, for the general public, lies in the indication they supply that in Mr. Justice Buckley the country has another learned Judge who can make up his mind within a reasonable period of time after the close of the arguments.

Mr. Ruegg on the Workmen's Compensation Act.

MR. RUEGG, Q.C., has established himself as an authority on the new branch of law which has broken out from the old jurisprudence by the Workmen's Compensation Act; and it is interesting to find, from his recent lecture on the Act to the members of the Solicitors' Managing Clerks' Association, that he holds pretty much the same opinion of this statute and its consequences that has always been expressed in these pages. Many of the opponents of the Act for political objects (among which dislike of Mr. Chamberlain and the desire to discredit his legislative work preponderate) have based their condemnation of the Act upon the supposed enormous amount of litigation that has sprung out of it. Mr. Ruegg denies this altogether—contending that, so far from having caused an undue amount of litigation, no change of the law of such fundamental character and far-reaching importance ever caused less. Mr. Ruegg does not like every principle or detail of the Act; and he particularly objects to the obligation imposed on employers to compensate workmen for accidents which are due more or less to their own negligence or misconduct. He would apparently have preferred the onus of proof as to liability to be shifted to the other side. But though this view is quite in accordance with abstract justice, those who have a practical knowledge of work and workmen realize, better than lawyers can be expected to do, that the line of negligence cannot be drawn very hard and fast around active operations. A clerk who has been out to a dance overnight may nod over his ledger, and no bodily harm comes to him in consequence; but if he were driving a barrow-load of concrete along a plank over a gasholder tank, the results might be serious. The real difficulties of the Act have not arisen over this question of misconduct, but with reference to problems of interpretation and limitation. These have been of a knotty character, and their solution has given the Judges some trouble. The Courts have worked upon what Mr. Ruegg called the only safe canon of construction of an Act of Parliament—namely, that "the intention of "the Legislature must be gathered by giving the usual "and ordinary signification to the words used, apart from "any consideration as to what well might have been or "should have been intended." It is advisable to bear this useful rule in mind.

No Petroleum Legislation this Session.

THE petroleum industry can breathe freely for the current year, so far as any prospect of Government action is in question. This was made clear by the reply of the Home Secretary last week to Mr. Provand, who asked whether anything was to be done this session on the line laid down by Mr. Jesse Collings on March 15 last. On this occasion the Under-Secretary stated that the Government would deal with the questions of dangerous lamps and oils, and that the Home Office Bill to this intent had long been in preparation and was in a forward state. Sir M. W. Ridley has now stated that the whole question is of so controversial a nature that there is no chance of anything satisfactory being done with it while Parliament has so much else to attend to. This reply is eminently satisfactory; for it cannot be successfully argued that the subject is urgent. Besides, events in the commercial world are tending in the direction of the automatic settlement of the matters at issue in the sense desired by those who raised the factitious clamour against the "deadly low-flash American oil." This commodity was otherwise classified as the refuse of the American refineries, which could not be disposed of elsewhere. The United Kingdom was spoken of as being the "dumping-ground for Rockfeller's rubbish," and so forth. During the past year, the course of the market has hardly justified this view of the trade. The so-called "trash" has been steadily growing scarcer and dearer; the imports showing a falling off of 43¼ million gallons (all in lamp oil) as between 1897 and 1899. On the other hand, the imports of Russian oil have attained such magnitude that nobody need burn a pint of American oil unless he likes; and if he prefers the "deadly rubbish," he has to pay rather more than a penny a gallon extra for it. A curious way, that, of "dumping" a commodity upon the market! Moreover, the independence of the American dealers has almost become a proverb in the trade. So far from their seeking custom, they have not sufficient supplies to satisfy the demand. If the followers of a "fad" were amenable to reason, they would see in all this ample justification for leaving the oil trade alone. If they still rage against American oil at 1¼d. per gallon more money than its largest competitor, they only lay themselves open to the damaging inquiry as to how much dearer they would like it to be. Which would expose the trick.

WATER AND SANITARY AFFAIRS.

IT will be seen by our "Parliamentary Intelligence" to-day that the Private Bill business of the session began in earnest last week; a number of Bills having passed the second reading stage in the House of Lords, while those in the Commons were read the first time, and either ordered for second reading or referred to the Examiners for their usual certificates as to compliance with further Standing Orders. The two Water Bills of the London County Council are in the former group in the Commons; but their progress has been checked by "blocking" motions put upon the paper by three members. Sir F. Dixon-Hartland, the Chairman of the Thames Conservancy Board, is only waiting for the second reading stage to be

reached to move the rejection of the Welsh Water Bill; and Mr. Whitmore and Mr. Goulding, the members for Chelsea and Devizes, will support him, and extend their hostility to the Purchase Bill. The Vestry of the combined parishes of St. Margaret and St. John, Westminster, are petitioning against both Bills, and the Middlesex County Council against the latter. Looking farther afield, we find the Glamorgan County Council have been keeping their eyes upon the little Parliament in Spring Gardens, and have not been particularly satisfied with their gigantic scheme for appropriating some of the water which is considered to belong of right to Wales; and therefore they have instructed their Parliamentary Committee to petition against the Bill promoted with the object of obtaining legislative sanction to it. But in the event of the Government introducing a Bill to carry into effect the recommendations of the Royal Commission—a step which, as already remarked in these columns, is hardly to be expected in the present position of political affairs—there will be a poor prospect of the Council carrying their two measures through. Even if the Government decline to take up the Metropolitan Water Question again this session, and the Council endeavour to profit by this inaction to further their plan of campaign against the Water Companies, there are already indications that their success, if achieved, will not by any means be the result of a "walk over."

The pages of the "JOURNAL" during the past few months have borne evidence of the fact that water engineers and those who are responsible for maintaining a supply of water have, one way or another, a good deal of anxiety in connection with their duties. When the skies refuse for a prolonged period to yield rain, they view with much concern their gradually diminishing stores of water; and even when they have plenty of water, they are sometimes hampered in distributing it. A few weeks ago, we showed how Mr. Ingham, the Borough Water Engineer of Torquay, had been troubled by the obstruction of his mains through the formation therein of a deposit which in the course of a few years reduced the delivering power of the pipes to 51 per cent. of their full discharging capacity. His colleague at Plymouth has had a similar difficulty to contend with; but in both places scraping has been very beneficial. In these cases the pipe is attacked from within. But the engineer is now beginning to find out that it is liable to be attacked from outside. The introduction of electric tramlines lays his mains open to the action of electrolysis—a cause of deterioration which is every day receiving more and more attention. We have dealt with this subject from time to time in the "JOURNAL," and quite recently gave the results of Professor Blake's experiments in Kansas City, where the pipes of the Water Company were affected. The trouble has now come nearer home. At a meeting of the Manchester City Council only a few days ago, Sir John Harwood, the Chairman of the Water Committee, called attention to the damage caused to the water-mains by the escaping electric current, and the consequent danger. Alderman Higginbottom, the Chairman of the Electricity Committee, tried to make out that the conditions which give rise to electrolysis do not exist in Manchester, as the Committee are working under Board of Trade regulations. His remarks, however, did not go for much in face of the statement by Sir B. T. Leech that he could show iron pipes pitted over with soft places; and as they were in proximity to electric cables, the inference was justifiable that it was the electricity which had affected them. It was decided—wisely, we think—to have a conference between the Chairmen of the various Committees concerned, with the view of instituting an investigation by experts. This subject has been studied a good deal in America since the effects of electrolytic action were first discovered in Boston some eight years ago; and it appears that there is only one real remedy for the trouble, and that is to prevent the pipes from being traversed by electric currents. Professor Blake says that no asphalte coating will protect them; and that nothing but the avoidance of conduction will ensure immunity from electrolysis.

The Origin of the Word "Acetylene."—According to M. Capelle, the author of "L'Eclairage au Gaz Acétylène," Berthelot gave this name to the well-known gas in honour of Berzelius, who called the hypothetical radical of acetic acid "acetyl." The composition of acetylene (C_2H_2) bears the same relation to acetyl (C_2H_3) as ethylene (C_2H_4) does to ethyl (C_2H_5).

ESSAYS, COMMENTARIES, AND REVIEWS.

GAS AND WATER COMPANIES IN THE STOCK MARKET.

(For Stock and Share List, see p. 487.)

BUSINESS on the Stock Exchange still drags along. Markets continued in a very lifeless condition during the early days of last week. A little more activity followed the advance of Lord Roberts into the Orange Free State; but the improvement was chiefly the result of professional operations. There is no real backbone to any movement without public support; and this is withheld for the present. Nor is it likely to revive until some decisive advantage is gained over the Boers. The Government announcement that the total amount required to meet the war charges will be £23,000,000 led to the impression that there is no intention to make a first issue of Consols; and the market accordingly stiffened up. But all gilt-edged securities have shown remarkable steadiness. The upward tendency of the Money Market is, however, against any marked rise in Consols, which is not likely to occur just at present. As regards Gas stocks, we have again to chronicle a small business, taking the market as a whole, though early in the week a fair amount was done in Gaslight ordinary, which has declined 1. The market has since presented a firmer appearance, as no business is recorded under 105½ since Thursday, when the price was put down to 105-107. The secured issues were very quiet, and maintain their values. A few transactions were marked in the other Metropolitan Companies; but quotations are unaltered. As regards the Suburban and Provincial group, Brentford consolidated and ditto new were put down 2 points, and British Gas ½ to 43-44. There was rather more doing in the Foreign group, especially in Malta, which are quoted ½ lower, at 4½-5½. A few dealings were recorded in Imperial Continental, River Plate, San Paulo, Oriental, and Buenos Ayres. As to Water stocks, the market was absolutely stagnant, till Saturday, when East London were quoted 2 points higher, Grand Junction 1, and West Middlesex 2; but Kent fell 3.

Concerning the daily operations: The only feature on Monday was a decline of ¼ in British Gas to 43-44; business being done at 43 and 43½. Gaslight was active, dealings being recorded between 106 and 107; 4 per cent. preference was dealt in at 120½; and the 3 per cent. debentures at 99½ and 100. South Metropolitan changed hands at 135½ and 134⅜. The only change on Tuesday was a decline of ½ in Malta Gas to 4½-5½; but Gaslight was again active at rather easier figures—the stock changing hands between 105¾ and 106¾. The maximum 3½ per cent. was dealt in at 97 and 97½. There was business recorded in Imperial Continental at 216 and 217½, Oriental new 6 9/16, River Plate 11 1/16, and in South Metropolitan and San Paulo. Wednesday was extremely quiet, even in Gaslight stock, which changed hands at 106½. Brighton and Hove ordinary was dealt in at 256, and the "A" at 187; Buenos Ayres new at 9⅞; and River Plate debentures at 101. Southampton Gas ordinary rose 1½ to 115-120. Thursday was also a quiet day; and lower prices were accepted for Gaslight stock, changing hands at 105, and the 4 per cent. preference at 121½. Commercial was dealt in at 309½, Imperial Continental 216, South Metropolitan 136½ and 135, ditto debenture 100, and San Paulo 12. There was a little more doing on Friday; business being recorded in Gaslight between 105½ and 106¼, European at 20⅜, Imperial Continental at 218. Malta was active at about 15; and Monte Video changed hands at 11½. Saturday as usual was quiet and featureless, and very little business recorded even in Gaslight, which marked 106 and 105½. Some business was done in Brighton and Hove at 257, and in Imperial Continental at 217¾. Water stocks, which have been idle all the week, showed some changes, though there was no business recorded.

ELECTRIC LIGHTING MEMORANDA.

Electric Traction an Experimental Success on the Metropolitan Railway—Positive Advantages—Limitations—Free Wiring at Lincoln.

A HIGHLY important statement concerning the results so far obtained from the electric traction trials undertaken by the two Metropolitan Railway Companies was made by Mr. J. S. Forbes at last Thursday's meeting of the District Company. We are particularly interested in this authoritative communication, inasmuch as Mr. Forbes dealt categorically with some of the queries put in this column on the 30th ult. This is what was to have been expected of the Chairman of the Metropolitan District Company, who knows perfectly well what are the essentials of successful railway working, and is too much a master of his trade to waste the time of a meeting with the twaddling generalities of the ornamental director. What Mr. Forbes says about railway working "goes," as the American language has it; and, therefore, when he declares that the experiments with electric traction have established the fact of its possessing certain positive advantages over steam locomotive traction, this statement is deserving of respect. We are careful to make it perfectly clear that this intelligence is important chiefly owing to the fact that it is Mr. Forbes who publishes it, because, as was remarked on Jan. 30, there is no trusting the mere electrical prophet in any matter. Mr. Forbes does not require credentials from the "JOURNAL" as to capacity or integrity, and it would be impertinent in us to

offer anything of the kind as a compliment to himself. In saying so much about the responsibility assumed by the District Chairman in this connection, the object is to explain why the information is to be regarded as of such importance.

Mr. Forbes states that the essential factors of electric traction for the Metropolitan Railways have been determined by Sir J. Wolfe Barry and Sir W. H. Preece. They are satisfied that with electricity they could move a much larger weight than that of the Companies' ordinary trains. The train capacity could be increased from 450 to 500 passengers; and the greater weight could be moved more rapidly, with greater certainty, with much less exhaustion of time in stopping and starting, and, they fully believed, more economically per train-mile than in the case of ordinary trains. These answers meet the desire we expressed for proof of positive advantages of electric over steam hauling. Everybody will agree with Mr. Forbes that this is a very satisfactory statement for him to be able to make. These positive gains, of course, will have to be realized after a considerable expenditure of fresh capital on the alteration of the system of working; and it will be for the Directors to determine whether they are worth having at the price. The Chairman said enough on this score to indicate that, to his mind, at any rate, the probability is great that the economy to be effected, and the increased capacity in working, will quite compensate for the cost and trouble of making the change. He did not doubt that "all this would be a matter of history three years hence." Upon the tender point of the running powers of other Railway Companies over the Metropolitan lines, Mr. Forbes would say no more than that the Great Western and London and North Western Companies "might be persuaded to make the change if they were shown it would be to their advantage to do so."

It may be advisable to remark that the last question refers only to the local working. It is necessary to guard against the assumption, to which some people may be expected to jump instantly on hearing of Mr. Forbes's communication, that the days of the steam locomotive are numbered, even in the case of the great railway lines, and that within the space of three years electric traction is going to whisk passengers and goods from Liverpool to London, and from London to Penzance. The Chairman of the District Railway Company was speaking with respect to the Metropolitan traffic only, which is a different matter altogether from main-line work. It may lie within the bounds of possibility that the great trunk lines will be worked wholly or partially by electricity within the lifetime of readers of these words; but nothing that the Metropolitan and Metropolitan District Companies have done towards solving their own local traffic problems applies equally, if it applies at all, to trunk railway conditions. It should be remembered that if electricity is adopted for working the underground railways of London, it will be only coming into its own inheritance, reserved for it from the beginning of these undertakings. Of course, when this happens, a great impetus will be given to electric traction generally; but it is well that the public should understand that there has been no epoch-making invention to this advance. It is quite possible that some soaring promoter will arise and claim to have the future of electric railways in the hollow of his hand; but it will not be true. Money will be needed for this and other extensions of electric engineering; but there will be no risk if the public only remember always that electricity is only a tool like another, and shut their pockets the moment anybody begins to talk about it as being a "magic wand," and so forth.

An interesting account of a year's experience of a "free wiring" system has been given in the "Electrician" by Mr. C. S. Vesey Brown, who represents the Corporation of Lincoln in this matter. Here, as elsewhere, the wiring difficulty was a serious one; and the Corporation entered into a contract with the National Electric Wiring Company for doing all that was required in this line "free of cost" to the consumer, who was charged for the accommodation 1d. per unit extra on his average maximum demand, and a halfpenny per unit extra for everything beyond. There does not appear to be much of a gift about this arrangement; but Mr. Vesey Brown confesses that with gas sold at 2s. 1d. per 1000 cubic feet, inclusive of meter-rents, the electric lighting business in Lincoln has to be cut very fine. He thinks the arrangement a fairly successful one, all things considered; because out of 185 houses in the area of supply 45 took it up. This is all very capital; but he proceeds to state the number of connections per quarter since the commencement, which "gives the whole show away." For the first quarter there was a big rush, for Lincoln, of fifteen shops and nine residences. The following quarter only three shops and three residences came in; and this stupendous crowd of six applications per quarter has been the average ever since. If the Corporation Electrician and the Free Wiring Company are satisfied with this amount of patronage of their mutual arrangement, all that can be said is that they must be easy to please. The plan is reasonable enough in its way, for obviously something is required to induce a yearly tenant to venture upon electric lighting. But in Lincoln, at least, the number of people who are attracted by this facility is small.

According to the Russian "Board of Trade Gazette," the total production of petroleum at Baku last year amounted to 524,200,000 poods, as compared with 486,000,000 poods in 1898—an increase of 38,200,000 poods.

SOME FANTASTIC STANDARDS OF LIGHT.

From time to time we have called attention of readers of the "Journal" to the persistent efforts of M. Violle and others to produce standards of light by the aid of platinum heated to its melting point or thereabouts, or of carbon or platinum raised to incandescence by the expenditure of electrical energy. We surmised that no practical working standard of light would result from the labours of these visionaries, and were not surprised to find that well-recognized flame standards were subsequently suggested as suitable practical reproductions of the fantastic model standards which it was claimed had been elaborated. Lately Mr. J. E. Petavel has made a lengthy communication to the Royal Society on researches which he has carried out in the Davy-Faraday Laboratory, on several electrical and platinum standards of light. We append a *résumé* of this paper, the text of which will be found in No. 422 of the "Proceedings of the Royal Society."

Flame standards are briefly mentioned, and the Harcourt pentane gas standard and the Hefner-Alteneck amyl acetate lamp are stated to be the lights which, from every point of view, have been found most satisfactory. Of the two, the Hefner-Alteneck lamp is said to be the better known, and to be fairly representative of its class. Dr. Liebenthal's researches, described in the "Journal" (Vol. LXVII., p. 125), are quoted to show the serious effect of moisture and carbonic acid in the atmosphere on both these standards. It may be pointed out that the multitude of pentane standards devised at various times by Mr. Harcourt appears to have confused Mr. Petavel, who first gives a reference to the original pentane air-gas flame, which has been accepted by numerous Committees on Photometry as the most reliable representation of the average light of one standard candle. He then quotes Dr. Liebenthal's researches, which were made on a portable pentane 1-candle lamp, as evidence of the unreliability of the "Harcourt lamp"—leaving his readers to infer that this is identical with the Harcourt air-gas flame. The Harcourt 10-candle lamp, which is now in use in the Metropolitan testing-places, was evidently not in Mr. Petavel's mind; and Dr. Liebenthal's researches in no sense apply to it. It is a curious fact that this lamp does not yet appear to have been tried by Continental photometrists, though it has very marked advantages over the Hefner-Alteneck lamp, which is generally adopted by them.

On the strength of Dr. Liebenthal's work, which, as we have indicated, does not refer to the most practical and readily-produced modern flame standard, and in direct conflict with the conclusions on the effect of humidity of the atmosphere on the light emitted by luminous flames arrived at by the late Board of Trade Committee on Photometric Standards, Mr. Petavel passes condemnation on the whole class of such standards, and proceeds to discuss "incandescent standards." With regard to these, he remarks that the constancy of the light depends essentially on the constancy of the temperature at which the radiating body is kept, and on the constancy of the emissivity of the body at that temperature. The occurrence of some definite physical phenomenon—such as the fusion of platinum—may define the temperature, or it may be arbitrarily determined. The choice of a substance, to serve as a radiator, which will not disintegrate at 3100° Fahr., is confined to carbon or one of the metals of the platinum group. Bearing in mind these facts, and the essential qualifications of a standard of light—viz., that it must (1) continue constant, (2) be reproducible, and (3) resemble in spectral composition or colour the artificial lights in common use—Mr. Petavel proceeds to describe attempts he has made to utilize a portion of the area of the crater of the electric arc as a standard of light. In this endeavour, he was following in the footsteps of Swinburne, S. P. Thompson, and Blondel.

It is difficult to obtain a suitable disposition of the crater of the arc for the purpose, since the negative carbon ordinarily hides the crater. After some other arrangements had been tried, the carbons were eventually placed at right angles, and provided with suitable means of adjusting their relative positions. Light emanating from a small area in the centre of the crater of the positive carbon, was allowed to pass through a hole, 1·47 square millimetres in cross section, in a cooled diaphragm, to the photometer. In one series of experiments, in which the arc was in a metallic enclosure kept at about 68° Fahr., by water circulation, the mean intrinsic brilliancy of the crater was found to be 147 candles per square millimetre. With the enclosure at a temperature exceeding 1650° Fahr., the mean brilliancy appeared to be about 4 candles less; but as variations from the mean of 10 per cent. occurred in the observations under both conditions, the difference was probably due to unavoidable experimental errors. Mr. Petavel concludes that the crater of the arc does not possess the qualities required of a standard, though provided the arc is silent, variations of current, &c., will not cause the intrinsic brilliancy to vary by more than 10 per cent. from the mean value. He also made observations on "hissing" arcs, with a view to computing therefrom the temperature of the electric arc. Mr. Petavel estimates this temperature at about 7000° Fahr., and considers that his experiments confirm the theory that the crater of the arc is at the temperature of volatilization of carbon.

Mr. Petavel then proceeds to describe experiments which he made with the incandescent platinum standard proposed by

Drs. O. Lummer and F. Kurlbaum. This consists of a strip of platinum foil 25 mm. wide and 0·015 mm. thick, raised to incandescence by an electric current of about 80 ampères. The temperature is increased until one-tenth of the total radiation, as determined by a bolometer, is found to be transmitted through a water-trough 20 mm. in width. The remark that "the construction of the instruments require (*sic*) the greatest care, and three months had passed before I was able to obtain the first observations," prepares the practical photometrist for the conclusion that the light is impracticable as a working standard. The pity of it is that any scientist should have spent so much valuable time, and wasted the resources of the Davy-Faraday Laboratory, in arriving at what anyone but an electrical enthusiast would have accepted as a foregone conclusion. The standard does not fail because of variations in the light when the conditions prescribed by the inventors are observed, but because of the practical difficulties of maintaining these conditions. The colour of the light, also, is too red. Nevertheless, it is used in the Imperial Physical Institute at Charlottenburg, to check the values of Hefner lamps.

Mr. Petavel passes on to deal with the molten platinum standard proposed by M. Violle in 1881. It is noteworthy that, though M. Violle does not speak of any great difficulties in the production and use of this standard, other experimentalists who have attempted to reproduce it—including the physicists at the Charlottenburg Institute—have signally failed. Recent work has been confined to attempts to produce suitable practical substitutes for the Violle standard. In 1896, the International Congress of Electricians held at Geneva adopted the Hefner unit as the practical standard representing the *bougie décimale* of M. Violle, which earlier congresses had precipitately accepted. Mr. Petavel essayed to reproduce the Violle standard. He made many endeavours to keep pure platinum in a state of fusion by means of the electric arc; but these were frustrated owing to the avidity with which the molten metal combined with incandescent carbon, silica, and other matters. It is essential that the molten platinum should have a clean surface; and as the slightest trace of foreign matter clouds it, some other method of fusing the platinum had to be selected. It was found that when a strong current was passed through a semi-circular bar of platinum, supported on a cooled nickel trough, a central channel of molten platinum contained in a shell of solid platinum could be secured. Mr. Petavel considers that this method is very promising, and hopes that it may be tried by others on large bars of platinum. The bars he employed were only 30 square millimetres in cross section.

On proceeding to attempts to melt the platinum by means of the oxy-hydrogen blow-pipe, he was met by a host of difficulties, and six months were spent on preliminary experiments. In order to obtain a clean surface of the molten platinum, it was found that pure platinum must be fused in a crucible of pure lime. The lime was obtained by igniting calcium carbonate which had been precipitated from calcium nitrate by means of ammonium carbonate. The fusion was effected by means of 4 volumes of hydrogen free from hydrocarbons and 3 volumes of oxygen. These proportions did not cause much superheating of the molten metal. An ingenious device was adopted for regulating the flow of the gases to the blow-pipe, and for cutting them off when the platinum was fused. Both the light which passed through a hole, 1 square centimetre in area, in a diaphragm placed above the surface of the platinum, and the light from the incandescent electric lamp which was used as the standard of comparison, were reflected by mirrors on to the screen of the Lummer-Brodhun sighting-box. The mirrors were interchanged after each series of observations, so that the effect of any inequality of absorption was eliminated from the mean of the results. The sources of light were fixed 130½ inches apart; and the sighting-box was moved on the bar, and each setting marked and subsequently read off. Settings were made at intervals of 10 seconds, until the platinum had cooled below its melting-point.

The standard of comparison was an incandescent 50-volt lamp, with a specially constructed divided resistance placed across the terminals, so that the pressure on the terminals could be kept constant for many hours, within 0·01 per cent. Under these conditions, the light afforded by the lamp remained constant. The superficial area of the platinum ingot was varied from 17 to 30 and 10 square centimetres; the weight of the ingot being 345 grammes. Observations were made in each case; and then observations were made with an ingot weighing 510 grammes. Mr. Petavel concludes that the probable variation in the light emitted by molten platinum does not exceed 1 per cent. when the following somewhat arbitrary conditions are observed: Total mass of platinum = 345 grammes in the shape of a disc; diameter of the hole in the cover of the furnace = 16 mm.; observations made after the blow-pipe, consuming 0·8 cubic foot of hydrogen and 0·6 cubic foot of oxygen, had been alight for 15 minutes. With more nearly perfect apparatus, with a mass of 1000 or 2000 grammes of platinum shaped as a half-sphere, and the quantity of gas burnt altered to suit the increased mass of metal, Mr. Petavel thinks it not impossible that the accuracy of the molten platinum standard would surpass the limit of accuracy of photometrical work which physiological limitations impose.

The investigations of which we have necessarily given a very incomplete account, have occupied Mr. Petavel for nearly three years; and he now asks for the advice of persons interested in photometry to aid him in continuing his researches to a more satisfactory conclusion. We imagine, from the general trend of his labours, that he will continue to work on the interesting, but impracticable, standards of light which apparently present so great an attraction to the academically nurtured physicist. If so, he will leave to others the investigation of problems of immediate practical importance—such as the determination of the effect of variations in the amounts of moisture and carbonic acid in the atmosphere on the Harcourt 10-candle lamp, which is now officially used for gas-testing in the Metropolis.

OUR COAL RESOURCES AND CONSUMPTION—A RECONSIDERATION OF SOME ESTIMATES.

THE present excess of the demand for over the supply of coal, in the presence, not of a restricted or diminished, but of what—leaving out of consideration the temporary restrictions due to the war—is a considerably increased and increasing output, not unnaturally renews interest in the question of the extent and estimated duration of the coal resources of the country.

It is over thirty years—a full generation—since the public mind was considerably agitated by alarmist reports of the near approach of the exhaustion of our coal mines. The rapid increase in the consumption of coal in the first half of the century, consequent upon the general adoption of steam-power, the creation and development of the railway system of the country, the substitution of iron for wood in the construction of ships—with the attendant growth of the iron and steel trades—the upspringing of the industry of coal-gas manufacture, and the progress of the arts and crafts of modern civilization generally, had for some time been impressing itself upon the minds of a few thoughtful men, when the debates in the Parliament of 1860 upon the Commercial Treaty with France demonstrated the lack of any reliable information relating to the coal resources of the British Islands, and of any intelligent forecast of the probable duration of the supply.

To provide the information so lacking, and thereby to afford some basis for the required estimate, Professor Edward Hull, the Director of the Geological Survey of Ireland, published in 1861 his excellent and comprehensive work on "The Coal-Fields of Great Britain; their History, Structure, and Resources," the fourth and last edition of which appeared twenty years later. [The book is now out of print; and we are sure that a further edition would be welcomed by all who know Professor Hull's work.] In the first edition of this book, Professor Hull gave estimates of the quantity of coal, both in the known and in the hidden fields, down to a depth of 4000 feet from the surface, based upon the best available data, which were not, in all cases, official and exact. In 1865, Professor Stanley Jevons—adopting Professor Hull's estimate of the coal stock of the United Kingdom—published his celebrated *brochure* on "The Coal Question," in which he sounded a loud note of alarm—giving for its justification an estimate of the probable growth of the consumption of coal in this country, and the consequent rapid and not far distant exhaustion of the mines. The agitation and concern to which the forecast of Jevons gave rise—not only in the minds of the general public, but in those of the leading statesmen of the day—resulted in the appointment in the following year (1866) of the famous Royal Commission on Coal. The Commission were ordered to investigate the probable quantity of coal contained in the coal-fields of the United Kingdom, and to report on the quantity of such coal which might be reasonably expected to be available for use. They were further to report as to whether it was probable that coal existed at workable depths under the permian, new red sandstone, and other superincumbent strata. Also they were to inquire as to the quantity of coal at that time consumed in the various branches of manufacture, for steam navigation, and for domestic purposes, as well as the quantity exported; and how far, and to what extent, such consumption and export might be expected to increase. The Commission, of which the Duke of Argyll was Chairman, and on which were some of the most eminent of the geologists of the day (including the late Sir Roderick Murchison, Director General of the Geological Survey of the United Kingdom), pursued their inquiries in the most thorough and exhaustive manner by means of Sub-Committees of Investigation, and did not produce their voluminous and most valuable report until July 27, 1871. We have now, therefore, some thirty years' statistics by which to examine, first the forebodings of Professor Jevons, and, secondly, the estimates of the Royal Commission. Since both the book of the former and the report of the latter are probably by no means fresh in the memory of our readers, and are, moreover, neither easily accessible to, nor purchasable by, many of them, we may usefully recall the most essential particulars of each, for the purposes of examination now and of reference at any future time.

We have first to deal with the question of the quantity of coal contained in our coal-fields, and the proportion thereof which may be looked upon as available under normal conditions of mining. The latter point is, of course, of the utmost practical importance; for coal may exist beneath our feet in infinite quantities without being of the least value to the community, if it lie at such a depth, or beneath such strata, as to make the

raising of it a matter of physical impossibility, or of such difficulty that the expense would be prohibitive. So soon as the supply of easily accessible coal shall have been exhausted, and the cost of production in respect of the remainder found to be considerably higher than the present cost of raising, coal from the vast beds of America will be able to compete with, and finally replace, English coal. Such an event will, so far as it is possible at present to foresee, synchronize with the decay of the iron and steel trades and the commercial supremacy of this country. In the words of the Commissioners, "it may well be doubted whether the manufacturing supremacy of this kingdom can be maintained after the importation of coal has become a necessity."

Professors Hull and Jevons, and subsequently the Coal Commissioners, took, as the limit of depth at which coal could be practically recovered, 4000 feet below the surface; though Professor Jevons expressed, but did not base his estimates upon, the opinion that a mine might, if necessary, be driven to the depth of 5000 feet. Professor Hull, in the book to which we have referred, devotes a chapter to the possibilities of deep coal mining. "The two main impediments to the prosecution of mining operations at great depths are,"* he says, "the increase of temperature in the strata themselves, and the pressure due to the weight of the strata. But as the latter obstacle is capable of being overcome in most cases, especially under the 'long-wall system' of mining, it may be omitted from consideration. . . . That the temperature of the earth's crust increases as we descend is a proposition which has been determined in the affirmative by observations extending over a large portion of the land surface itself. It is, however, to be observed that, compared to the radius of the earth, these observations extend only to a very small depth. Nevertheless, they are perfectly sufficient for determining the problem as far as it is calculated to influence the question of deep mining, though not as regards the physical constitution of the interior of our globe." The writer then proceeds to give various statistics of the increases in temperature found on descending different coal mines, "sufficient to show that the increase of temperature is a reality, which becomes a sensible obstacle at a slightly variable depth, and will have to be encountered and overcome by artificial means when the depth exceeds 800 or 900 yards [say, 2500 feet]. On this point, the Commissioners on Coal Resources have arrived at the conclusion that, at a depth of 1000 yards (3000 feet), the temperature of the earth would amount to 98°. Under the 'long-wall system' of working, a difference of about 7° appears to exist between the temperature of the air and that of the working faces . . . so that the depth at which the temperature of the air would, under the present conditions, become equal to the heat of the blood, would be about 3420 feet. Beyond this point the considerations affecting increase of depth become so speculative that the Commissioners leave them in uncertainty. But they consider it may be fairly assumed that a depth of at least 4000 feet may ultimately be reached in coal mining."† This may be achieved, it is hoped, through a reduction in the temperature by means of effective ventilation; it being possible for miners to work in temperatures approaching blood heat, owing to the comparative dryness of the atmosphere at great depths. It may be remarked, in answer to the thought that naturally arises that gas stokers and iron smelters work at times in much higher temperatures, that the heat they have to endure is radiant heat, not that of the air they are constantly breathing. Summing up on the whole question of deep coal mining, Professor Hull says‡: "I have considered it Utopian to include in calculations having reference to coal supply any quantity, however considerable, which lies at a greater depth than 4000 feet. Beyond that depth, I do not believe it will be found practicable to penetrate. The physical barriers appear insurmountable."

Having, then, arrived at the conclusion that coal lying more than 4000 feet below the earth's surface could not be reckoned as part of the available resources, Professor Hull estimated the quantity available, but unmined, in 1861, at 83,000 million tons. No account was taken in this estimate of any of the coal contained in the concealed coal-fields, by which is meant the coal-beds believed to exist, but as yet untapped, below the permian, triassic, and liassic strata. The estimate of 83,000 million tons was adopted by Professor Jevons as representing the coal stock of this country. Deducting therefrom the quantity estimated by Jevons to be raised in the eight years ending 1869—viz., 757 million tons—the stock as calculated by him at the end of 1869 equals 82,243 million tons. The Royal Commission, while adopting the depth of 4000 feet as being the limit of practicable mining, included in their report estimates of coal lying below that depth, and also of the quantity in the concealed beds. Their estimates of the country's stock of coal at the end of 1869, after allowing for the probable loss in hewing and raising, may be summarized as follows:—

	In Known Coal-fields. Millions of Tons.		In Concealed Coal-fields. Millions of Tons.		Total. Millions of Tons.
At depths not exceeding 4000 feet . .	90,207	..	56,273	..	146,480
Between 4000 and 6000 feet . . .	5,922	..	25,841	..	31,763
Over 6000 feet. . .	1,397	..	15,303	..	16,700
Total . .	97,526	..	97,417	..	194,943

* "The Coal-Fields of Great Britain." Fourth Edition, p. 482.
† *Ibid*, p. 492. ‡ *Ibid*, p. 505.

It will be seen that the careful investigation of the Commission resulted in an estimate of the known coal above 4000 feet, differing from that adopted by Professor Jevons from Professor Hull's calculations, by 7964 million tons—a quantity equal to less than 10 per cent. on Professor Hull's estimate. When, however, we say, as is the fact, that the total quantity of coal raised in the thirty years ended 1899 (a period equal to nearly a third of the time at the end of which Professor Jevons declared that we should be in dire straits for coal) only amounted to 4780 million tons, the difference mentioned will be seen to be a material one. The further quantity of 56,273 million tons estimated by the Commissioners, and admitted by Professor Hull (in the later editions of his book) to be rightly estimated, as existing at accessible depths under the permian and other strata—equal to somewhere about 250 years' consumption at the present rate—also modifies very considerably the forecast made by Professor Jevons. It is further to be remarked that neither Professor Hull nor the Commissioners took into account any estimate of the quantity of coal underlying the South-east of England. Sir Joseph Prestwich, one of the geological experts on the Commission, and one possessing a very full acquaintance with the geology of the Home Counties, was of opinion that coal would be found there at practicable depths. This opinion was embodied by the Commission in their report; but no calculation of the quantity of such coal was included in their estimates. Sir Roderick Murchison, on the contrary, was so decided in his belief that no coal-beds existed in those districts, that he qualified his endorsement of the report by appending thereto a protest against Prestwich's opinion. Events have decided in favour of Prestwich; but time alone will show—for it has not yet been proved—whether the coal that has been discovered in the south-eastern counties, is recoverable in such way, or in such quantities, as to make it of any commercial value. Should that eventually prove to be the case, the whole contents of the mines will be an addition to the coal resources of the country as calculated in the estimates we have quoted.

(To be continued.)

THE REDEMPTION OF GAS AND WATER COMPANIES' CAPITAL.

It will be remembered that one of the recommendations of the Powers of Charge Committee (Metropolitan Gas Companies) of last session was "that an effort should be made by any company having obsolete or unproductive capital to redeem such capital by sinking fund or otherwise." No suggestion was made at the time of a means for carrying this counsel into effect; and the Bills now pending do not touch the subject. This avoidance of the matter, by common consent of the parties interested, is open to the interpretation that they are at a loss for an acceptable plan of action upon the recommendation. There is much to regret in this course, on general grounds, and we deplore it for the special reason that it recalls our own abortive effort to get up a discussion of the question of the expediency and possibility of reducing gas companies' capital. We showed years ago that the operation of paying off municipal gas-loans must inevitably have the effect at some future time of making municipalized gas supplies compare with artificial advantage, in respect of capital burden, with gas companies' undertakings. This position was granted; but it was pointed out that gas companies have no right nor means of redeeming their capital, either from or outside the statutory dividend. Since the question was raised in these pages, many, including some of the most important companies' gas undertakings, have converted and consolidated their capital upon a basis not differing greatly from the market value of the property. Consequently, their capital now stands in the books on nearly the same footing as that of municipal gas capital; so that one great difference between gas company and gas committee accounts is to this extent removed. Even so, there has not been the slightest advance in suggestion, or in fact, towards treating of the two kinds of capital alike.

Hence, the recommendation of the Powers of Charge Committee must be regarded as pointless, not to say impertinent. The only ordinary way of writing off capital is by applying profits to this use; and where dividends are paid in full, or the selling price cut down to the barest margin, there are no surplus profits available for the purpose. The qualification of the recommendation—that only "obsolete and unproductive capital" should be redeemed—is plausible on the face of it, but cannot be sustained on the merits. It is not only their obsolete and unproductive capital that the gas-supplying municipalities have to pay off, but the whole of it. The distinction sought to be made here is just what the popular gas reformer would fancy; but it does not exist in fact. On the contrary, indeed, the loans that corporations have to pay off the quickest are those incurred for any actual and reproductive purposes—new Acts of Parliament, works extensions, and so forth. If there is any distinction made at all, therefore, between active and dead capital, it is that the former must be paid off first. Very properly, too; because this rule ensures that those for whom the new accommodation is made have to bear the expense of it.

But all this sinking fund business, be it observed, is dead against the cheapening of the product. How serious a question

this is for the consumers of a commodity provided by redeemable capital, is exhibited by the report of the Metropolitan Water Commissioners. The transference of a gas or water undertaking to a local authority at its fair value entails the institution of a sinking fund to repay the money borrowed for the purchase, in a certain number of years. The financial effect of this condition is far from being fully appreciated by all amateurs of municipalization. Doubtless posterity will profit by the arrangement; but meanwhile, unless the purchased income exceeds the interest of the loan taken up for this purpose, the sinking fund is an added burden on those who carry on the business, which necessarily makes the product dear. In other words, if municipal public debt were not all redeemable, the municipalization of certain permanent, freehold kinds of property would appear to offer more concrete advantage than it can present under the actual conditions.

It is necessary to break off here, and admit, parenthetically, that the London Water Companies are as a matter of fact subject to the obligation to redeem part of their capital by what is known as the Chamberlain's Sinking Fund. The nature of this quite exceptional arrangement is known to all those who follow our annual abstracts of gas and water legislation. It dates from 1886, at which time the purchase of the water undertakings was contemplated; and the idea was to prevent any additional value accruing to the undertakings, as a whole from the exercise of borrowing powers on easy terms. All additional capital needed by the undertakings was required to be raised on the best terms by the issue of debenture stock. It was assumed that all the money so raised earned its rateable proportion of the average profit made by the company employing it. The excess of the average percentage over the interest payable on the debenture stock issued, *plus* 1 per cent. for management, is taken as the profit earned by the new capital. This difference has to be paid to the Chamberlain of the City of London, as trustee, for the purpose of purchasing and holding shares of the Company and investing the dividend thereon, with a view to ultimately extinguishing the capital of the Company.

We have long regarded this experiment with a suspended judgment, and gladly take note of the deliberate opinion of the Royal Commissioners on the matter. They think that the operation of the clause goes beyond the intention of the Parliamentary Committee who passed it in the first instance. If the assumption that the dividend capital will always be employed at a profit greater than its cost, is not realized—as in the case of expenditure on improvement works not necessarily profitable—then the payments to the Chamberlain are so much loss to the shareholders, and retard the attainment of the maximum statutory dividend with the consequential diminution of charges to the consumers. Where the maximum dividend is paid, they may retard or diminish the reduction of charges. This is a lesson on the difficulty of tapping the "unearned increment" of profit, due to improved financial facilities, for the purpose of draining it off for outside uses. But there are other practical objections. The Chamberlain has to buy stock which is continually diminishing in quantity; and being always in the market purchasing against himself, he naturally has to pay dearly for the investment.

There remains to be considered the effect of such an arrangement on the transfer value of an undertaking. Are these payments to be dropped *ipso facto* with purchase by a public authority, on the score that the end for which they were enacted was attained? At the first blush, it would seem that this is the fair thing to do; but the Royal Commissioners have their doubts. After discussing the question with regard to various considerations, they can get no further than an opinion that an arbitrator would have to take their existence into serious account; while Parliament would probably make them useful in connection with the redemption of the purchase money. Altogether, it does not appear that this peculiar provision of Metropolitan water legislation is a great, if any, improvement upon the ordinary disposition of premium capital. Inasmuch, however, as the existence of the arrangement is due to the "wisdom" of the financial advisers of the City of London, it is deserving of particular study.

The net result of collating the recommendation as to the extinction of gas companies' obsolete or dead capital, with the observations of the Water Commissioners as to the means actually in operation for the reduction of the water companies' share capital, leaves the former exactly where it was before—as a mere "pious opinion." This may be esteemed unfortunate, or the reverse, according to the point of view. It is at least certain that we are left as far off as ever from any practicable opening whereby the formation of a sinking fund might be approached without appreciably increasing the capital burden pressing upon the shareholders or consumers, or both.

A New Gas-Engine.—A new vertical high-speed gas-engine, for which many advantages over the ordinary horizontal type are claimed, has just been constructed at the works of Messrs. T. Melvin and Sons, Engineers, Glasgow. The new engine is 4 feet long, with a breadth of 2 feet, and depth of 3 feet, and the weight is 1½ tons. The compactness of the machine, and its steadiness in running at high speed, are considered to be its most important features; and it is claimed for the engine that it is eminently suitable for electric lighting installations.

IN THE CAUSE OF INTELLIGENT HOUSE-BUILDING.

THE art of building human habitations is one of the least progressive of all arts. Considering the innumerable opportunities for advance and experiment offered by the incessant building operations that constitute the growth of towns, the statement might be strengthened into the positive declaration that there is more unintelligent repetition, and less invention and design, in house building than in any other department of human productive industry. House after house, terrace after terrace, suburb touching suburb—up they go, year by year, with a dreary, soulless monotony that weighs like a tangible burden upon the intelligent observer. Professional architects meet together and talk about their art; but they shudderingly repel the suggestion that they are in any way responsible for the making of suburbs. That is the work of the speculative builder, who is naught to the exalted artists of the R.I.B.A.; while he, for his part, as a fairly honest tradesman with a living to get and a public to serve, cannot afford to have any dealings with these Olympian eminencies. The architect differs from the engineer in many respects; but perhaps the greatest difference of all lies in the attitude of the members of these two professions towards the pounds, shillings, and pence of construction. The cheapest possible engineering construction is, with rare exceptions, also the best. The greatest triumphs of engineering are those most strictly bound to the severest economy of capital outlay and working costs. Most engineering is, in the end, adapted to the service of the mass of the community, and tends to cheapen common life and to ease it for the poor.

As regards building, the work of providing houses for the mass of poor, and comparatively poor, people to live in is left in the hands of the ordinary builder, who has to make the most of every brick and plank, and study the attractive power of a bit of stained glass or a quaintly-shaped porch against costly plumbing which is not seen by the casual eye of the "house hunter." This enterprising tradesman gets no guidance from the professional architect, who, indeed, is powerless to give it. Architects do not work for the "market"—the market, that is to say, where houses of over £50 rental are the higher limit. There was a meeting not long ago of surveyors interested in the practical development of building estates; and they all agreed that there is no "market" for houses of £80 rental. These expensive residences are the beginning of a fancy class of the builder's trade; but the popular "market" draws the line at £50 rental. The number of such houses built, and building every year, is enormous; and they are one and all outside the magic circle of professional architecture. The public who make this market cannot afford to have anything to do with professional architects; because where a speculative builder will provide a decent house "with all modern improvements" for £45 a year, if an architect is called in the annual cost will run up to half as much again. This is not altogether, not even chiefly, the architect's fault. It is mostly the difference between the price of a "ready made," and a "bespoke" article; but the result is deplorable, all the same. We are writing now facts, not fancies; and the facts of the housing of the mass of the population are of the utmost importance to many interests.

Among others, the interests represented by the "JOURNAL" are deeply concerned with the housing of that order of the people of England the members of which live in dwellings rented at from £20 to £50 a year. They constitute the bulk of private gas consumers for all purposes; and they are also the most heavily rated and taxed, in proportion to their means, of the English people. They do not see the "JOURNAL," and would be incapable of carrying out our suggestions and acting upon our counsels if they did; so we must be satisfied with endeavouring to serve them indirectly, through the public officials and professional men who do read these pages regularly. Here and there, perhaps, a little improvement may be helped forward thereby; and every little is so much to the good. We cannot hope to lighten the heavy monotony of character that makes the modern suburb so inexpressibly uninteresting; because this is due to the necessity, already acknowledged, of the most being made of every brick and piece of material. The modern "developed building estate," in effect, is an example of that standardizing process which in all organized manufactures is the key to the greatest economy of production. So it is that the experienced eye is able at a glance to classify row after row of "eligible villa residences" by their rental, to a pound; and the instructed vision can also see beneath the surface and tell exactly how they are put together.

The Public Health Acts, and the Building Bye-Laws of local authorities have done much to raise the standard of construction of suburban residences, by stopping the worst of the trickery of the dishonest builder. There is very much more to be done, however, in the way of securing co-operation in regard to the opening up of new "estates" between the proprietary interests, the local authority, and the public services of gas, water, telephone, and conveyance. Much deserved odium has been cast upon the English "building lease" system. This system has doubtless in the past been fruitful of "slum" settlements; but it exists, and the wise man will rather try to make the best of it which is possible, than waste time in devising fiscal traps for the "unearned increment." The necessity of road making offers the local authority their opportunity to have a hand in

the performance of suburb manufacture. The gas and water interests have also their part to play in regard to new roads. It ought to be possible to ensure the regularity of the building upon these roads, so as to avoid the awful gaps and stretches of "No-Man's land" which depreciate new neighbourhoods before the first houses built are a season or two old. There should be some rule of building continuously from one end, thus enabling the gas and water pipes and the road and side paths to be made good as the development goes on.

The improvement of building construction is a thing that cannot be forced far ahead of the demands of the public. These are very effective so far as they go, as is proved by the general addition of circulating boilers and fixed baths to all but declared cottage property. This luxury was such a heavy tax upon builders that improvement stopped with the same. We have recently looked over a number of houses to let, and examined some architects' designs for small residences, without discovering any advance upon the now standardized "bath-room, h. and c." of the house-agents' advertisements. It is the fashion; and having conformed to it, no attempt is made to do better, and some of the old-world conveniences of ample kitchen and scullery room, adequate cellarage and so forth, are sacrificed for its sake. It never seems to occur to anybody that people are not always bathing, or that, having the circulating boiler to start with, a good many things might be done with it besides providing one or two baths a day. Still there is no systematic provision in the small house for gas-cooking stoves and gas-fires. Consequently, these appliances are put in as extras—and the gas-cooker is only too apt to announce its presence in the house by a vile odour reaching right out to the front door, all for the want of a little provision for ventilation. The householder is hardly to be blamed for this. He hates "extras" and charges for accessories of all kinds. He has no objection to a gas-cooking stove, or to the cost of hiring it; but when he understands that the kitchen floor will have to be taken up for the gas-pipe, and that sundry other arrangements will be needed, he is discouraged. As to having a ventilation hood over the stove, which may or may not answer its purpose—he will not "run to it."

All these things are questions of fashion. Time was when nobody expected fixed baths, or circulating boilers with hot and cold water laid on, much less gas connections for stoves and lights. Not one shillingsworth of such fixtures will builders and landlords provide until they are made to realize that desirable tenants expect them. There are other matters, moreover, which go to improve building construction, but for which the £50 rent-payer will have to wait. Much work awaits doing in the way of fire-delaying construction. No house is really safe with the actual match-box staircases; and to sanction these for anything above one storey is worse than carelessness. The establishment of a rational practice in dwelling-house ventilation is still in the future. In the "JOURNAL" for the 30th ult., we gave an extract from a paper by Mr. Arthur Rigg on the ventilation of interiors, which is only another indication of the slight fashion in which the subject is commonly treated, even in relation to public buildings. Private-house ventilation cannot be said to exist apart from the common infliction of draughts. The wearisome controversy over ventilation methods for large public buildings, and the argument as to whether the foul air should be drawn off through high or low level openings, will never be settled until somebody goes to the trouble of ascertaining what happens in the actual working of typical arrangements. No record of ventilation systems on the large scale is worth the paper on which it is printed, without the addition of a certificate by some independent investigator that the intention of the designer has been achieved.

As regards private house ventilation, Mr. Arthur Rigg, who, in his paper already cited, laid such stress upon the removal of carbonic acid from and near the floor of rooms, will perceive that this is precisely what the common fireplace does. A floor-level temperature a degree or two above that of the outside air is thus preserved, while the temperature at the ceiling is about double this figure, for winter averages. Not an ideal condition of the domiciliary atmosphere, when it is freezing outside! But that such a state of things should be possible is entirely referable to the stereotyped fashion of building. The builder, as Professor Lewes remarks in one of his popular lectures, most scientifically provides against the danger of asphyxia by making doors and windows, flooring boards and skirtings, of a nice easy fit. But he spoils all, unfortunately, by making his ceilings and cornices tight—until the plaster falls off.

We began this essay by remarking on the generally unprogressive character of the art of building, and have gone into some details connected with a few householders' requirements to prove the allegation. A book might be written on the subject, if it were worth any one's while to perform such a thankless task. It is to be desired that whoever is solicitous to work in the cause of progress in this regard should collect, and put into circulation, all the facts it is possible to get hold of. Mr. C. F. Botley, for example, is working out at Hastings an interesting problem in artificial lighting and ventilation by the aid of a simple thermometer. More things can be done with a thermometer than the ordinary man wots of; and its competence to answer questions of ventilation is high. It is hardly necessary, for instance, to analyze the top stratum of the air of an inhabited apartment for carbonic acid when the temperature at the cornice is 90° and that at the floor line 45° Fahr. Nor is it wonderful that the family doctor is a frequent visitor to dwellings where this state of things commonly prevails throughout the winter season. If these things are constantly being observed and exposed to view, householders will begin to inquire about the general sanitary condition of their dwellings; and then improved building will follow.

AN EARLY WORKER IN THE GAS AND WATER INDUSTRIES.

It not unfrequently happens, in connection with the rise and progress of a great industry, that some of the men who have taken a by no means insignificant part in helping to establish it upon a permanent basis, are entirely lost sight of, or are known by name to only a few, when, in the process of time, the object for which they laboured has been attained, and the development of the industry passes into other hands. To a certain extent, this is the case with the gas industry. This is rather to be regretted; and when, some months ago, we had the pleasure of being introduced to a relict of one of these early workers in a field which has of late years yielded such rich harvests, we took the earliest opportunity of giving our readers some particulars respecting him. Within the past few days we have received an account of another of these early workers—William Matthews—contained in a biography written by his great-grandson.* The preparation and production of this story of his ancestor's work has evidently been a labour of love to the author; for not only has he been at infinite pains to collect the necessary material, but he has actually printed the book at his private press. As to how he has executed this part of his task, we shall say nothing—being concerned rather with the matter itself than with the manner in which it is presented. We will only say that we think it was a pity, while his book was in the press, he decided to limit the issue to 66 copies. But it may be presumed that the original intention was to distribute it among the remaining members of the family.

William Matthews was born at Birmingham on Feb. 26, 1771; his father being a saddler carrying on business in the Bull Ring. Nothing is known about his boyhood; but at the age of seventeen he became acquainted with Dr. Priestley. Having a taste for literature, he readily took to the Doctor's works, and entered deeply into theology and science. In April, 1802, his attention was first attracted to gas lighting, to which he was devoted all his life. He witnessed the illumination of Messrs. Boulton and Watt's factory at Soho, carried out by Murdoch to celebrate the Peace of Amiens, and described it as an "extraordinary and splendid exhibition of gaslight." He was thus early, as he acknowledged nearly thirty years later, "led to appreciate its value, and to anticipate the great advantages which would probably result from its gradual improvement and extended adoption at some future period." Shortly after this event, a friend of his—one Josiah Pemberton—made numerous experiments, at his premises in Bull Street, in the manufacture and purification of coal gas, and discovered its utility for manufacturing purposes, such as soldering, &c.

Owing to stagnation of trade in Birmingham, Mr. Matthews came to London in 1805. During his first few years' residence in the Metropolis, he took the opportunity of seeing some of Winsor's exhibitions of gas lighting; but, owing to their frequent failure, they did not meet his approbation. Moreover, being aware of Murdoch's previous experiments, he felt that his former fellow-townsman was being deprived of his right to be called "the discoverer of gas lighting." On subsequently learning that Winsor had been assistant to Le Bon, who had shown gas-light in Paris in 1801-2, Mr. Matthews was led to minutely criticize many of the German's pretensions, and attack them from time to time. In fact, he was always a firm supporter of what he regarded as a prior claim. An instance of this is recorded in the case of a Mr. Cook, who, in 1810, was awarded a silver medal by the Society of Arts for a gas apparatus for soldering tubes and other articles. Mr. Matthews was indignant at the award, knowing that his friend Pemberton had constructed and fixed the appliance in Cook's shop.

In 1815, Matthews went back to his native town, and started a carpet and furniture warehouse; but he was unsuccessful, and returned to London in 1821. During his second residence in the Midland capital, however, he devoted himself ardently to gas lighting, having become personally acquainted with Samuel Clegg, from whom he obtained a considerable amount of information. Little is known of his life for the next few years; but his great aim appears to have been to oppose the establishment of new gas and water works in the Metropolis, on the grounds that the existing Companies were able to supply all that was needed. One of the earliest of the projects to be denounced by him was that brought forward in 1823 for the establishment of the London and Westminster Oil-Gas Company; Ricardo and others maintaining that oil gas was better than that made from coal. Many gas makers, however, held the contrary opinion; and Mr. Matthews sided with them. About this time he began to write on gas lighting—obtaining some useful information from both Pemberton and Clegg. His earliest published article appeared in the "Technological

* "A Biography of William Matthews, the Expositor of Gas and Water Engineering." By Arthur Weight Matthews. Published by the Author at 330, City Road, London.

Repository" for July, 1827, respecting a statement made that a Mr. Leadsom, of Birmingham, had patented an "ammoniacal process" for purifying gas. Mr. Matthews asserted that such a process had been employed by Mr. Wilson, of Dublin, in 1817. It was also stated that Mr. Cook, of Birmingham, recommended the use of lime for purification; and Mr. Matthews pointed out that this had been already done by Murdoch in 1805. His literary efforts resulted in the production, in October, 1827, of his first book, entitled "An Historical Sketch of the Origin, Progress, and Present State of Gas Lighting," which was favourably reviewed. In the following month he published "A Compendium of Gas Lighting," in which he claimed that he had conveyed to his reader "a clear and intelligible description of the general principles and practice of gas lighting." These publications, the latter of which is noticed in the first volume of "King's Treatise on Coal Gas," were received with but little favour by those who had already written upon the subject; and a controversy ensued between Mr. Matthews and Mr. F. A. Winsor, son of Winsor of Lyceum fame. Peckston criticized them unfavourably; and some strong language was used on both sides.

Early in 1828, Mr. Matthews endeavoured to obtain the position of Secretary to the Imperial Gas Company; but in this he failed. About the same time he became a contributor to the columns of the "Morning Advertiser," advocating the use of meters by licensed victuallers. His attention was also drawn to proposals to establish new Gas Companies in London; complaints having arisen as to the charges and the monopoly of the Chartered Gas Company. One of the new undertakings was the British Gas Company, and the other the West London Gas Company. Mr. Hedley, the principal Engineer of the former, having published a pamphlet which he addressed to the Lord Mayor, censuring the Chartered Company for their "excessive charges and the inferior quality of their gas," Mr. Matthews published another, also addressed to the Lord Mayor, repudiating the assertions, and declaring the object of the writer to be to "depreciate and degrade the Chartered Company in order to elevate the British Company with a plea of supplying the Metropolis with purer and cheaper gas." He also denounced the scheme of the West London Company as "an artful plan for the sordid interest of its projectors, and not, as professed, for the benefit of the citizens." During the year, a patent appeared for a "domestic gas apparatus," to enable householders to make their own gas by the aid of a common fireplace. Although he vigorously attacked this apparatus, he was not opposed to real improvements in gas appliances, as he thought very highly of those made by Clegg and the Crosleys.

In 1827, Mr. Matthews got into a controversy on the Thames water question, complaints having been made against the use of that water for dietetic purposes. How history repeats itself! He thought the water was not so impure as it was represented to be. A great point was made of the pollution of the Thames by gas-works refuse; but Mr. Matthews endeavoured to show that the assertions were erroneous. A Mr. Vanhesan, a chemist, supported him—saying that "ammoniacal liquor, commonly called gas water, is too valuable to be thrown away." Coming back to gas, we find Mr. Matthews, towards the close of 1828, in the midst of controversies on "portable gas" and Mr. Winsor's claims. A Mr. Thick, a Director of the proposed West London Gas Company, now enters the lists, and comes in for some hard knocks. About this time a prospectus appeared for a "South Metropolitan Gaslight Company," which Mr. Matthews put down to Mr. Thick. An incident not unworthy of notice was the fatal explosion in the oil-gas manufactory at Covent Garden Theatre. This accident led Mr. Gordon, the patentee of the "portable gasholder," to recommend it as producing the safest of all lights; whereupon Mr. Matthews disputed the statement. This controversy lasted some months. It ended by Mr. Gordon stigmatizing Mr. Matthews as the advocate of great incorporated coal-gas companies, and attributing his hostility to "portable" gas to fear of rivalry. The latter retorted that to talk of rivalry was absurd in view of the fact that the companies' price was one-seventh that of portable gas.

During these controversies, Mr. Matthews had not neglected water matters. In an anonymous pamphlet entitled "The Water Question," he severely criticized the assertions made with respect to Thames water. He characterized the alarm which had been raised concerning this water as a contrivance for getting up a new company. A parliamentary inquiry took place; and, as the result, in August, 1829, Sir Robert Peel addressed a letter to the three Water Companies in West London, recommending a scheme for improving their supply by obtaining water from the Colne and from the Thames above Richmond. The Companies rejected the proposal; whereupon Mr. Matthews published a pamphlet on the subject of the letter, and addressed it to "one of the proprietors of the Grand Junction Water-Works." It was his "Water Question" pamphlet, with a postscript justifying Sir Robert's action as being prompted by the "purest motives and an ardent desire to serve the public."

The death of Winsor in Paris, in 1830, once more drew the attention of the public to his claim to be the discoverer of gas lighting; and as the obituary notices which appeared in the papers gave him this credit, Mr. Matthews once more stood up in support of Mr. Murdoch. This led to more newspaper correspondence and some hard hitting. In 1832, second editions of the "Compendium" and the "History" were published; but the contents of the books were practically the same as in the first edition. In 1834, Mr. Matthews was employed in one of the departments of the New River Company; and in November of that year he issued a prospectus of a work to be entitled "Hydraulia," which he had prepared from materials collected in the previous four years. The book appeared in April, 1835, and was received with general commendation by the Press. Just after the closing pages were printed, and prior to publication, the author's attention was drawn to the prospectus of a "Pure Spring Water Company." Finding it contained many of the old stories concerning the river being polluted with gas refuse, he commented upon the scheme in the preface of "Hydraulia," and repudiated the idea that a sufficient quantity of water could be obtained from borings. About this time a Bill for supplying London with water in accordance with a scheme prepared by Mr. Telford was rejected by Parliament, much to Mr. Matthews' satisfaction. His engagement with the New River Company gave him an insight into the internal working of the concern; but his excessive anxiety to elucidate what seemed to him to be not very clear led to his dismissal. He thereupon addressed the shareholders by means of a pamphlet, in which he exposed the "great expenditure unaccounted for by the managers." At this time there were great complaints as to the Company's supply, especially at fires; but Mr. Matthews' criticism of their affairs did not prevent him from supporting them, and declaring that they were capable of supplying all the water that was requisite. An inquiry into this matter was held by the City Lands Committee of the Corporation, extending over several weeks.

As Mr. Matthews began with gas, so his last publication was issued in defence of this illuminant. In September, 1835, complaints were made by the parishioners of Lambeth in regard to the dulness of the gas-lights; and several meetings were held at which the supplying Company were reprimanded. Mr. Matthews made an investigation into the matter, and in November published a pamphlet entitled "Gas Lighting Projects," in which he complained of the Parochial Authorities heavily taxing the Company's pipes—thus raising further contributions from them—and then, disregarding the terms of the Act of Parliament requiring them to give a proper light in the streets, bringing the bright light "down to the murky glimmering of oil-lamps," in order to save about one farthing per night on each public light. He therefore thought that, if fair play were given to the Company, there would be no need of a rival which pretended that it could manufacture gas at a cheaper rate and give a better light. The views expressed in this pamphlet by Mr. Matthews were supported by the "Mechanics' Magazine," "not only because of his long and familiar acquaintance with gas matters, but because of the perfect honesty of purpose which characterizes everything that issues from his pen." This pamphlet, as already stated, was his last publication. He died at his daughters' house at Hampstead on Sunday, March 27, 1836, in his 66th year; and his remains were interred a few days later in the detached burial-ground of Hampstead Church.

In addition to gas and water works, Mr. Matthews took great interest in other branches of engineering, among them being canal navigation. His writings were received with some favour abroad; his "Compendium" being translated into French by M. Merle, for his "Traité sur le Gaz," a short extract from the "History" being added. His "Hydraulia" was reviewed in the "Journal des Savans;" and extracts from his various letters appeared in Dingler's "Polytechnisches Journal." He is described by his biographer as being "persevering in all he undertook; weak in business habits, but fond of learning, and very quick at figures. A good critic, though his replies were often embittered with sarcasm and ridicule." Finally, he was "ever ready to give assistance for the benefit of his fellow-beings."

A Vitrified Clay Water-Pipe, about 2 miles long, was laid in La Salle (Ill.) in 1884, as a gravity supply line from springs to a pumping-station. The pipe was 24 inches in diameter, and put together with portland cement joints. It was laid through bottoms along the Illinois River, and a portion of the route was across very swampy land which was overflowed every year. The pipe is now leaking in many places, due, it is believed, to the settlement of the line and the breaking of the joints. It will be replaced by a 24-inch cast-iron main.

The Duty of Pumping-Engines.—In a recent number of the "Engineer," there is a report by Mr. W. Cawthorne Unwin, F.R.S., of two trials of a pair of triple-expansion vertical pumping-engines supplied by Messrs. Hathorn, Davey, and Co., of Leeds, to the Corporation of the town. The effective work in the case of the second engine was $167{\cdot}6 \times 1{,}980{,}000 = 331{,}850{,}000$ foot-pounds per hour. The actual coal consumption was 296·5 lbs. per hour. Hence the actual duty was 125,350,000 foot-pounds per 112 lbs. of coal. Mr. Unwin explains that the efficiency of the boiler was not good; and therefore the duty was not exceptional. With a good boiler, hand fired with Welsh coal, the evaporation might, he says, very well have been 9·5 lbs. per pound of coal. Then the coal consumption would have been 240·8 lbs. per hour. In that case the duty would have been 154,350,000 foot-pounds per 112 lbs. of coal—an exceptionally high duty. The practical result of the installation has been that, in spite of the growth in population, the coal consumption at the Corporation (Headingly) station has now been reduced to about one-half its former amount.

PERSONAL.

Alderman T. SPEIGHT, of Bradford, who was for some years Chairman of the Gas Committee, has sent in his resignation.

Mr. C. F. KENT, of Wokingham, succeeds Mr. W. C. Jones as Manager of the Kingswinford works of the Brierley Hill Gas Company.

Mr. J. C. HALL, of Ilford, and formerly of Ruthin, has been appointed Manager of the Ennis Gas-Works, in succession to Mr. G. H. Stewart, who goes to Southbank.

The management of the Dundalk Gas-Works, which has been relinquished by Mr. G. R. Love in order to take the position at Guildford vacated by Mr. Reilly, has been entrusted to Mr. G. AIRTH, of Paisley.

The Directors of the Manningtree and Mistley Gas Company, Limited, have appointed Mr. J. W. BROOKE, of Mistley, to be Secretary and Manager, in place of the late Mr. Mauldon. Mr. J. F. SISSEN has been re-appointed Managing Engineer.

Mr. A. V. DANIEL has resigned his position as Manager of the Portishead Gas-Works, and will be succeeded by Mr. A. W. STONE, formerly a pupil of Mr. T. Canning, the Engineer and Manager of the Newport (Mon.) Gas Company, in whose department he has recently been engaged.

The Town Council of Elgin have resolved to disjoin the offices of Gas and Water Manager. Mr. JAMES KAY, the Gas Manager, who was appointed last year, will have charge of the gas undertaking only; and the duties of Water Manager will be performed by Mr. TURRIFF, who is also Burgh Surveyor.

After thirty years' service as Secretary of the Ceara Gas Company, Limited, Mr. THOMAS GUYATT has been offered a seat at the Board, which he has accepted; and his second son, Mr. GEORGE RAIT GUYATT, has been appointed Secretary in his place. It will be seen by our report of the meeting of the Crystal Palace District Gas Company last Friday, that Mr. T. Guyatt was unanimously elected to fill the vacancy in the office of Auditor caused by the retirement of Mr. Alfred Lass.

It will be with a feeling of regret that the information will be received that Mr. S. STEWART, Gas Engineer to the Corporation of Greenock, contemplates retiring. Mr. Stewart has held the position of Manager of the gas undertaking at Greenock for more than forty years. The members of the Gas Trust have every reason to be satisfied with Mr. Stewart, and they are very unwilling to part with him. It is understood that an endeavour will be made to arrange that, while he will be allowed to retire from active duty, his services will be retained as Consulting Engineer.

Mr. ALEXANDER DICKSON, who has been Secretary of the Kent Water-Works Company for the past thirty years, has resigned his position; and, in appreciation of his long and valuable services, and of his earnest and successful labours in furtherance of the interests of the Company, he has been granted the full retiring allowance to which he is entitled, and been appointed to fill a vacancy on the Board caused by the death of Mr. George Smith, who was formerly the Chairman. The Company are much to be congratulated on the fact that, though parting with one who has rendered such great assistance in furthering the interests of the shareholders as well as those of the consumers in the district, and who has seen the Company rise to its present state of prosperity, Mr. Dickson will still be associated with the direction in any action that may be necessary as the result of the report of the Royal Commission on Water Supply. Mr. Dickson has occupied the combined positions of Clerk, Secretary, and Accountant to the Company; and we understand that, by desire of the Board, he will continue to supervise the transaction of business pending the completion of existing negotiations and the transfer of the full duties.

OBITUARY.

We regret to record the death of Mr. W. BARRATT, who, up till 1895, was Engineer of the Grantham Gas Company—a position he had occupied for rather more than twenty years. Deceased was one of the founders of the Eastern Counties Gas Managers' Association, of which he was the first President.

The Board of the Ventnor Gas and Water Company have had the misfortune to lose within the past sixteen months four of their members; the last to be removed being one of the most recently elected—Mr. W. H. CHATFEILD CLARKE, who died suddenly, at his residence at Niton, on the 3rd inst.

We regret to record the death of Mr. JOSEPH COWEN, of Stella Hall, Blaydon-on-Tyne. The name of Cowen, as our readers are aware, has been identified for a very long period with the manufacture of fire-clay utensils—an industry which was established at Blaydon Burn more than 150 years ago. The first gas-retorts were made there in 1826; and Messrs. Cowen's goods have ever since been celebrated all the world over, the firm having shown retorts and other "objects in fire-clay" at most, if not all, of the great exhibitions. Deceased was known to members of the North of England Gas Managers' Association from his attendance at their meetings. He had been in indifferent health for some few years; but a serious change took place last Sunday afternoon, and he passed away during sleep—the cause of death being cardiac failure. He was in his 71st year.

We regret to record the death, on the 10th inst., in his 71st year, of Mr. W. B. DAVIDSON, who for about 45 years was connected with the Tynemouth Gas Company. He joined the staff as a young man; and his persevering efforts and business ability obtained for him the position of Secretary, which he filled with conspicuous credit to himself and to the entire satisfaction of the Directors and shareholders until about two years and a half ago, when he retired. The officials and workmen then presented him with a handsome reading-chair, towards the purchase of which the Directors also subscribed. Mr. Davidson is survived by four sons and two daughters. The interment took place on Monday last week at Preston Cemetery; the Company with which deceased was so long associated being represented by the Chairman (Mr. J. B. Williamson), the Vice-Chairman (Mr. W. S. Oxley), and the Engineer (Mr. W. Hardie).

NOTES.

The Manufacture of Wire Ropes.

Mr. J. Dixon Brunton, in a paper read before the Scotch Iron and Steel Institute, treats of the actual state of the industry of wire manufacture, which is a fast growing one, as fresh uses for metal wire are found every day. Roping wire is a branch of trade of great and increasing importance. Mr. Brunton claims to have made a special study of this class of wire, and to be able to produce plough steel rope wire with a very high breaking strain and exceptionally tough. The difficulty hitherto in manufacturing this class of wire has been to get the correct temper of the steel required for the various strains, and the correct temperature at which to heat these different grades of steel before tempering. Modern improvements in iron-works laboratory practice, and especially the advance in pyrometry and knowledge of the use of the microscope, has removed much of the difficulty; and wire-making practice has consequently become much more exact. The qualities specified by the rope makers vary considerably; the tensile strain alone ranging from 30 to 130 tons per square inch. The diameter of the wire must also be very rigidly adhered to. Mr. Brunton described the process of, and the necessity in some cases for, galvanizing the wire intended for rope-making. Wires for hausers and the ropes used in wet mines are galvanized; but Mr. Brunton did not say anything as to the reliability of this means of preventing corrosion.

Lightning and Street Electric Lights.

A remarkable series of photographs of electric street lamps during a thunderstorm, by Mr. Sydney Webb, of Dover, was published in "Nature" for the 8th inst. Professor G. G. Stokes, of Cambridge, appends some critical observations on the photographic record. It appears that Mr. Webb's original intention was to photograph the lightning which was expected; but when the pictures were developed it was found that the public arc lamps had come into the field. Every one of these was betrayed to be sending off a flow of visible electricity to the ground in an irregular line. Thus the lightnings of the lamps were more novel and interesting than those of the sky; and next time there was a thunderstorm at Dover, Mr. Webb was ready with his camera to register the effects. On the second occasion, the electric arc lighting was supplemented by the seasonal decorative lighting by incandescent electric lamps festooned between the arc-light standards along and across the roadway. The effect of the arrangement on the sensitive plates was striking. The discharges of lightning overhead were accompanied by a maze of irregular discharges from every electric lamp to the ground, which, as Professor Stokes says, look as if they might be dangerous. He is inclined to regard the phenomenon as "a case of Nature's wireless telegraphy." He joins with Mr. Webb in hoping that photographers will follow up the inquiry by exposing a few plates in the neighbourhood of electric lamps when there is a thunderstorm. It is thought that the currents of these local discharges is chiefly spent in electrifying the air. If so, they may not be so dangerous as some of them look. Still, says Professor Stokes, "until we know more about the subject, it might be prudent in a thunderstorm to keep a little away from arc lamps in a street"—but on the other side from the high-potential mains.

Improving the Quality of Steam.

A suggestive article on the quality of steam has appeared in the "Engineer." It was apparently inspired by the reflection that fuel for steam raising is, and is likely to remain, dear. Consequently, anything tending to economy of steam, and to its most advantageous use, is of present interest. As regards the quality of steam, it is remarked that very few steam-users appear to have even a remote idea that it has any qualities at all—that it can be good, bad, or indifferent. Yet it is understood upon reflection that there is such a thing as dry, clean steam; but few power-users trouble themselves to make sure that this is what they are getting from their boilers. Good steam is quite dry—that is to say, it does not carry suspended water with it. Neither does it carry suspended dust or dirt; and it has about 10° of superheat. This is the working fluid with which all steam-engines will give the best possible results; and when engines are required to run continuously for a long time, this is the quality of steam which least provokes breakdowns. Unfortunately, superheating is still the exception rather than the rule; while

priming is the rule instead of the exception. When boilers are clean, fed with clean water, of ample power, good design, regularly fired, and near the engines, the proportion of entrained water may be as low as 5 per cent. in the steam. When the entrained water is sandy or gritty instead of clean, and there is enough of it, trouble is sure to follow. The drying of steam is an extra. It can be effected by an oil-jacketed attachment to the main steam-pipe, with the oil kept hot after the manner of a circulating boiler; or it can be done at small expense by a gas-heating arrangement, something of which nature was years ago tried by Mr. Bryan Donkin. Possibly the subject may be reopened by this suggestion of superheating by means of oil.

The Tempering of Steel.

Mr. A. Campion, discoursing on the heat treatment and the micro-structure of steel, remarks that the variety of definitions of annealing given in books and current among theorists and practical men induced him to investigate the matter, with the object of ascertaining the methods that were most suitable for annealing various grades of steel. This inquiry has not yet been completed; but Mr. Campion has published an interim statement of the results so far attained. Beginning with the point of the best temperature to which steel should be raised in order to anneal it, and how, the author found a very considerable difference of opinion prevalent in this regard. It was proved by physical and microscopical tests that, in the case of mild steel, such as is usually supplied for constructional uses, there is a fairly wide latitude of temperature to which the metal can be heated to anneal it, or at any rate to considerably increase its ductility. The best results were given by experiments in which the sample was heated fairly rapidly to the required temperature, which did not exceed 750° C., or a red heat. The change from hardening carbon to cement carbon takes place somewhere about 40° or 50° below this critical temperature; and as the time-element comes into important play at this stage of the process, it is imperative to let the steel, after having been made red hot, cool down as slowly as possible through this modifying temperature. Tempering may be done without raising the metal to the higher temperature named, though only by keeping it for a long time at the modifying temperature; but the result is not so good. In the case of higher carbon steels, it is necessary to work to closer limits of temperature, which must be ascertained for every particular instance. A properly annealed steel is defined as a metal which possesses the highest possible ductility with the lowest possible tensile strength for its grade, accompanied in all cases with fine grain. The metal is then in the best condition for withstanding dynamic strain.

Furnace Management.

A thoughtful letter on the dearness of fuel and the economies that may ensue from this condition of the fuel market, has been communicated to "Engineering" by Mr. George Craig, F.I.C., of Glasgow. The writer remarks that all improved and labour-saving methods of stoking boiler and other furnaces make greater demands on the intelligence of the users, the more they do away with mere drudgery. This is a general law of mechanical progress, which is liable to be overlooked occasionally. Mr. Craig also draws attention to the fact—not usually to be found mentioned in treatises on heat—that the calorific value of a fuel is not everything. Even of greater importance is a right understanding of the conditions under which a boiler, or whatever it is, is capable of producing the best results, and also of the suitability of different fuels or methods of firing for realizing these conditions. It is through attention to this consideration that extraordinary results have been obtained from oil and gas firing. In the case of steam raising, for example, it has been proved that 1 ton of fuel oil is equal to 2 tons of coal, although the relative theoretical evaporative powers are only as 17 to 14. The great economy of the oil fuel is simply due to the greater facility it affords for being burnt with just the right quantity of air, and no more. Those who have had to deal with gaseous firing know that a similar result follows from its use. Notwithstanding the vast importance thus shown to attach to the proper burning of all kinds of fuel, users of solid fuel have been the last to act upon this warning. Mr. Craig has devised an instrument which he calls a "Combustion-Tester," for continuously and automatically ascertaining and registering the proportion of carbonic acid gas in the flue gases of a furnace. It is urged that no works manager having furnaces to look after should be satisfied without some means of knowing at any and all times what these are doing. From 19 to 20 per cent. of carbonic acid in the steam-free fuel gases is the theoretical ideal; but by the use of the testing instrument, as much as 17 per cent. may be expected with gaseous firing. With solid fuel the proportion, and consequently the saving of fuel, is much less; but still Mr. Craig holds out the hope of getting this figure up to 15 or 16 per cent. Very often, where there is no check, the carbonic acid is down to 8 per cent., or even to 4 per cent., which means a waste of 50 per cent. of the fuel burnt.

Mr. Norman E. Cash, son of Mr. Thomas Cash, has commenced business at 32, Trinity Road, Birmingham, as representative of a number of firms dealing in gas specialities—Messrs. Alder and Mackay, of Edinburgh, the Anchor Tube Company, of Birmingham, Messrs. John E. Williams and Co., of Manchester, and Messrs. Nicholson and Co., of Halifax, being among the list of firms in which he is already specially interested.

TECHNICAL RECORD.

THE CHARLOTTENBURG GAS-WORKS.

We are now able to continue our translation of the description, furnished us by Herr A. Müller, of the Municipal No. 2 Gas-Works at Charlottenburg, of which he is Manager. The first instalment, together with a ground plan of the works, appeared in the "JOURNAL" for Nov. 14 last (p. 1188); but, to facilitate reference, the plan is reproduced to-day.

The No. 2 retort-house, marked B on the ground-plan, was erected on the site indicated, on account of the local conditions. Borings of the ground for the retort-house had revealed the fact that it was everywhere very bad building ground; and a firm foundation was not to be obtained at a depth less than 20 feet. The building was therefore constructed entirely of iron; and brickwork was used only as a lining for the walls. The construction was designed to transmit the pressure of the wind on the side directly to the middle of the house, where the firm soil for the foundations was highest. The roof is partly grooved tiles, and partly Monier; the latter being adopted where only a slight inclination is available. The ventilation is by turrets in the roof, and light is admitted by windows both in the upper part of the sides and in the roof of the house.

The question whether stoking machines or sloping retorts were to be employed, was decided in favour of the latter, owing to the bad building ground, which was only fitted for the erection of a narrow house, while stoking machinery necessitates wide charging-stages. The No. 2 house is intended for a make of 6,400,000 cubic feet of gas in 24 hours. There are to be 64 Coze settings of nine retorts, each 15½ feet long, arranged in eight stacks, each consisting of eight settings. There are four stacks on each side of the house; and the settings are back to back, so that the coke can be immediately conveyed from the sides of the house to the coke-yard. One chimney serves for every eight settings. The working is conducted in the following manner.

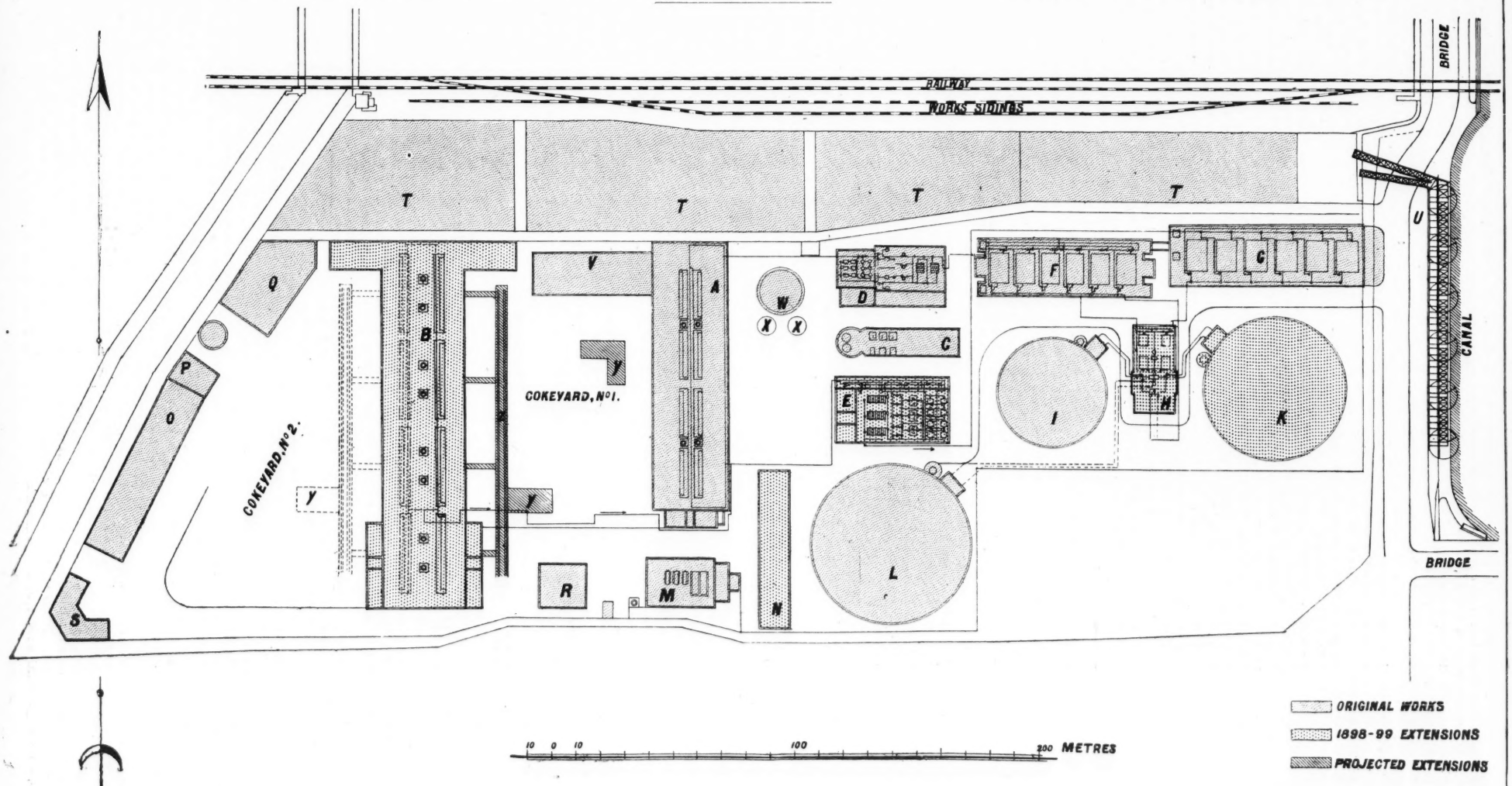
The coals are shot into the coal-breaker erected in the northerly annexe to the retort-house, from the coal-stores (coal-sheds have still to be built); and after they have been broken, they are transferred by means of a band-convevor to a coal-receiver placed beneath the roof of the house. From this they fall on to a horizontal band-conveyor, which passes above the whole range of settings and conveys the coals into receptacles, arranged one above each stack. From these receptacles the coal is drawn off into charging hoppers of special construction, each of which contains only the charge for one retort. The charging hoppers travel along a suspended rail in front of the settings. When a hopper has been filled, the mouthpiece of the retort is opened, and the charge drops into the retort. The coal distributes itself uniformly on the bottom of the retort by gravitation. After carbonization is complete, the coke is discharged through an opening which is provided in the stage in front of each mouthpiece, on to a De Brouwer conveyor trough which runs beneath the stage in front of each stack. The coke is carried by this to a band elevator by which it is raised to the high-level tramway for conveyance to the coke-preparing plant, where it is broken and sorted according to size into four distinct classes.

Gas passes from the retorts through ascension-pipes, 26 feet high, to the hydraulic main on top of each stack. It goes thence to a large foul main, and is drawn by the exhauster to the apparatus—or No. 2 condenser—house. The retort-house is provided with five elevators. Two of these are for raising coal to a stage above the hoppers, for conveyance in trolleys to the section of the house where it is required. These are for use only in case the coal-transporting machinery fails. Two elevators are provided on the high-level coke tramway, to raise the coke to it for conveyance to the coke-preparing plant. The fifth elevator carries fire-bricks, iron goods, coke, &c., up to the discharging stage. All elevators are worked by hydraulic power at a pressure of 50 atmospheres. The power is generated in the hydraulic power house, in the water-tower building. Attached to the retort-house are bath-rooms and workmen's lobbies.

The apparatus house (D) is massively constructed with an iron roof, covered with slates. It is divided into four sections for apparatus thus: (*a*) the tar-extractors, (*b*) the condensers, (*c*) the washers, and (*d*) the tar centrifugals. There are five tar-extractors, each consisting of a rectangular wrought-iron vessel containing perforated plates, which offer resistance to the passage of the gas, and thereby deprive it of a portion of the tar it contains. The tar passes through suitably arranged pipes into tar wells beneath the extractors. The gas, after traversing the tar-extractors, enters the condensing plant, which comprises eight Reutter condensers. These are furnished with self-acting sprinklers; and the condensation products are conveyed to the tar-wells already referred to. There are three exhausters for drawing the crude gas from the hydraulic main through the tar-extractors and condensers, and forcing it through three washers arranged to work in parallel, three scrubbers similarly disposed, meters, and purifying plant, to the holders. The same portion of the building also contains tar and liquor pumps, and the steam-engines which drive them. The tar and liquor from the washers and scrubbers are conveyed to an adjacent room, where they are dealt with by five centrifugal tar

GROUND PLAN OF THE MUNICIPAL GAS-WORKS (NO. II.) AT CHARLOTTENBURG, NEAR BERLIN.

CAPACITY OF COAL-GAS PLANT, 8,830,000 CUBIC FEET PER 24 HOURS; CAPACITY OF WATER-GAS PLANT, 2,649,000 CUBIC FEET PER 24 HOURS.



A Retort-House No. 1.
B ,, ,, No. 2.
C Pumping Plant.
D Condenser-House No. 1.
E ,, ,, No. 2.
F Purifying-House No. 1.
G ,, ,, No. 2.
H Meter and Governor House.
I Gasholder No. 1.
K ,, No. 2.
L Gasholder No. 3.
M Boiler-House.
N Workmen's Lobby.
O Workshops.
P Experimental Gas-Works.
Q Boiler and Engine House.
R Stores.
S Offices.
T Coal-Stores.
U Coal Unloading Plant (Hydraulic Cranes).
V Water-Gas Plant.
W Gasholder for Water-Gas Plant.
X Oil-Tanks
Y Coke Plant.
Z Coke Transporting Plant

separators, and run off into underlying tar and liquor tanks. A second purifying house—marked G in the plan—is now arranged for, and will be provided with six purifying vessels and two revivifying floors. Four station meters, placed in the governor-house, deal with the whole of the gas made. The same house contains the governors which control the pressure in the distributing system.

A third gasholder of 3½ million cubic feet capacity will be erected in front of No. 2 condenser and apparatus house.

The steam for the complete plant is to be produced by an extended boiler installation in the boiler-house. The existing hydraulic plant is likewise to be extended to a corresponding degree. The present coal-raising apparatus will also be increased by the addition of four hydraulic cranes provided with grabs. In connection with this, a coal-shed is to be erected, and furnished with Hunt's coal-discharging apparatus, to automatically convey coal from the stores to the retort-houses.

Other buildings are the offices, the workshops, the coal-testing place, the water-gas house, the coal-breaking and sorting installation, and a new engine and boiler-house. The average consumption of gas per head of the population of Charlottenburg in 1898-99 was about 3600 cubic feet per annum. The number of inhabitants was 170,000; and the extension of the works will, on the basis of the same rate of consumption per head, serve for the supply of a population of 490,000.

A LABORATORY METHOD FOR THE ANALYSIS OF COALS FOR GAS MANUFACTURE.

At the Meeting of the Manchester Section of the Society of Chemical Industry on the 5th ult., Mr. J. G. A. Rhodin, F.I.C., read a paper on the above subject. The following is the text, with a short report of the discussion, as given in the current number of the Society's "Journal."

From the point of view of the analyst, this subject presents many difficulties, as the technical users require to know not only the chemical constituents of the coal, but also certain physical properties, the determination of which falls rather outside the sphere of the ordinary analytical practice.

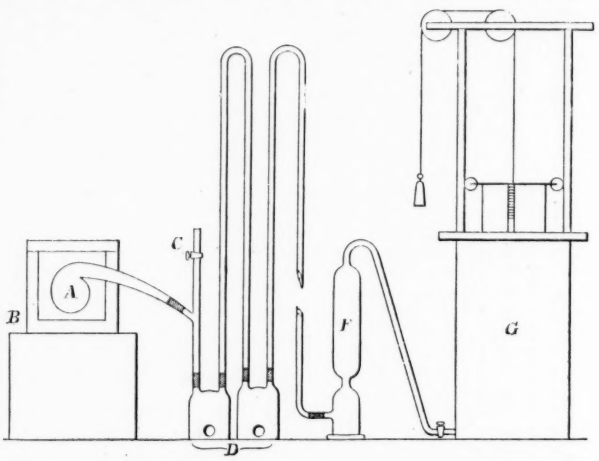
In consulting most of the written works on gas manufacture and the assay of the materials for the purpose, the chemist finds not what he wants, but a description of a certain amount, or rather large amount, of special apparatus designed for use in gas-works. However ingenious the apparatus may be, it is generally too cumbersome, expensive, and arbitrary for use by the scientific chemist. Nothing is left to the skill and judgment of the analyst, and everything depends upon the apparatus in the first instance, and the instructions accompanying the same in the second instance. To take an example: When you are requested to determine the amount of gas developed from a ton of coal, and its illuminating power, you are supposed to use iron retorts 3 feet long, and gasholders weighing something like half a ton, and all kinds of gauges and apparatus for regulating the flow of gas, &c. You are told to use 1000th part of a ton (roughly 1 kilogramme), for the experiment, and also to use pieces of the size of a walnut. The question whether an average sample can be obtained in this way is not discussed; and you are told to repeat your determination several times, and take a mean of the results.

In considering the question, I could not exactly see the reason why work on this large laboratory scale should give a better result than work on a smaller scale, selecting your sample more carefully, crushing the coal to smaller particles and quartering the sample, and selecting a final example of (say) 100 grammes. In fact, I made up my mind that a sample obtained in this way ought to be more representative than the sample obtained in the other way, even if the latter were larger, considering the size of pieces recommended. All practice of mineral, metal, and ore analyses has proved that, if a proper average sample be chosen, it can be made fairly representative, even if small in quantity. When it is a question of gas coals, however, where the gas evolved has to be examined as to its illuminating power, the sample must not be too small. We require at least 20 to 30 litres of gas for the determination of the illuminating power. A specimen of 100 grammes is quite sufficient for this purpose. This is so much more to be recommended as the temperature required for driving an equal amount of gas out of cannel coals, as that produced in technical practice is the most extreme white heat obtainable by ordinary fuel. I tried different temperatures on a sample of cannel coal, and found that only from 60 to 70 per cent. of the gas could be obtained by heating the coal in an ordinary muffle furnace for gold and silver assays, the temperature being about 1000° C.

The furnace used by myself was a Fletcher furnace for draught. I then determined to use unglazed porcelain retorts with the Fletcher injector furnace, and I constructed an apparatus for the purpose, the details of which are given below.

The apparatus consists of the following parts: B is a Fletcher injector furnace, and through its side a porcelain retort A is fitted by drilling a hole through the material. The neck of this retort communicates with an air condenser, the tube having a branch C closed by a cock. I constructed the air condenser out of small Woulff bottles with a bottom tubulure, which can serve for letting the tar out when the apparatus is cleaned. The main part of the condenser is made out of long U-shaped tubes, about 6 feet in length and 10 millimetres internal diameter, connected with these bottles by rubber ligatures, as shown in the illustration. Five or six of these tubes are sufficient for all practical purposes. For purifying the gas, I use a large-sized Fresenius tower F, which I charge with soda lime. Two of these towers might be used, one charged with lime and the other with ordinary ferric hydrate, such as is used in gas-works; but the soda lime, on account of its physical properties, is better for laboratory experiments, as it ensures the apparatus against accidental stoppages. From this purification tower the gas is led into the gasholder G, which is constructed both for measuring the gas and the regulation of its subsequent flow; and I have chosen a very small diameter in order to get large readings on the scale. The divisions being about 3 centimetres for 1 litre, the bell is roughly 20 centimetres in diameter and 1 metre long, and fitted with a tube for holding the thermometer, &c. The counterpoise is also arranged on well-made rollers, and the gasholder constructed so as to be perfect and as smooth in its run as any regulator which it is possible to obtain.

When making an experiment, I charge the retort with 100 grammes of the coal to be analyzed; and through the tube C I displace all the air in the condenser and purifying apparatus, either by gas from the mains, or else by working a small charge of 10 grammes of coal in a small retort through the same. The unoccupied volume of the condenser and the purification apparatus in the retort being only a small percentage of the volume of the gasholder and the gas to be measured, the filling of the apparatus from the main would not cause any appreciable error apart from the great saving in time and labour. As it is always desirable to control results by repeated experiments, I prefer to work on three charges of 50 grammes, one after the other, and



Scheme of Arrangement for Developing Gas.

to let out the gas from the first charge—making an approximate estimation of the illuminating power, and utilizing the gas from the two last charges for its accurate determination.

For some classes of coals, 150 grammes might be found to be too much for the capacity of the gasholder which I have constructed, and which holds 30 litres. In this case, the first working off of 50 grammes will show what quantity will be carried. One mode of procedure is as follows: I work off the charge by heating the retort slowly during the first five minutes, and afterwards increasing the heat as soon as possible to an intense white. It is generally next to impossible to prevent all the tar from entering the gasholder; but in the construction which I have made, this holder can be easily cleaned from the inside. In about 20 minutes the charge is worked off, and the apparatus is disconnected from the gasholder, which is left to stand for a short time to allow the gases to assume a uniform temperature, which is then observed together with the barometric pressure. Afterwards the volume is reduced to gas of a temperature of 60° Fahr. and 30 inches barometric pressure (the gas saturated with water vapour). The coke formed out of cannel coal can easily be removed out of the retort by shaking the same—a thing which is not the case with caking coals, which require a rather larger retort made of iron to screw apart.

When the gas has been measured, the gasholder is connected with the burner on the photometer, and you can then easily proceed to take the illuminating power. According to the usual custom, you regulate your flow of gas so as to have, roughly, 5 cubic feet passing in an hour from the burner; and it is customary, for gas from cannel coals, to utilize an ordinary batswing burner. For coal gas an argand burner is required, the normal burner being described very particularly in the "Instructions" of the Referees. For those who prefer to do so, a burner fulfilling exactly the requirements can be obtained from any firm supplying chemical apparatus. The regulation of the flow of gas is done by means of a large tap with a rather long lever. The approximate flow is observed on a suitable indicator, such as, for instance, Thorpe's instrument. The actual flow of

gas is taken by time observations and measurement on the gas-holder, and the pressure in excess of that of the barometer by means of a small water-gauge on the holder.

I do not propose to give the exact operations with the photometer, which are all well known. I only wish to remark that for the measurement you ought always to compare with at least two spermaceti candles, as the readings become larger than is the case when only one is employed. It is self-evident that, even with the best arrangement for regulating the flow of gas, it is impossible to make this flow to correspond absolutely with 5 cubic feet an hour; and hence corrections have to be made to reduce the actual result to that obtainable when the exact amount of gas is passing. The ordinary procedure for doing so is to reduce the volume of gas per hour, as shown by the gas-holder, to 60° Fahr. and 30 inches barometric pressure, afterwards to divide by 5, and divide by this figure the result in candle powers obtained before. Correction is also made for the spermaceti burned per hour, and the candle power reduced to that corresponding to candles burning 120 grains per hour.

I may say there are very grave objections to this method of calculation, and the results are not absolutely accurate. For instance, when the gas burns in air of less density, a smaller bulk is burned than if the air had the normal temperature and pressure. As the illuminating power depends upon the fierceness of the combustion, it is evident that a somewhat larger correction ought to be made for the low pressure, as this gas, when issuing, does not come in contact with as much and as dense oxygen per surface unit as it should do when burned under normal conditions. Theoretically, a gas issuing from an orifice has work exerted upon it by the weight of the gasholder; this work being converted into heat when the gas issues from the narrow slot—the heat being retained by the issuing gas. This gas also exerts a certain amount of work upon the surrounding air; the equilibrium of temperature being slowly brought about by the cooling effect of the air into which the gas issues. Under the same conditions of temperature and barometric pressure, we can therefore supply a different amount of energy to the issuing gas, inversely proportional to the size of the slot in the burner, and directly proportional to the pressure above the atmospheric pressure exerted by the gasholder. If the same volume of gas issues per unit of time, your pressure depends upon an alteration of the burner orifice. If the formula usually employed for reducing the illuminating power to the normal conditions be correct, such an alteration in the potential energy of the gas would not affect the illuminating power.

The experimental evidence required for arriving at an accurate formula for the purpose of reducing illuminating power, can be obtained by burning the same kind of gas in burners with different orifices under the same conditions of pressure and temperature. Another factor that will have to be taken into consideration is the moisture in the air, as this will strongly influence the cooling effect upon the flame, for obvious reasons.

With reference to the photometer to be used, this instrument may be of any construction which allows an accurate estimation of candle power. The main part of the instrument—namely, the photometer head—ought to be of a construction which is less liable to personal errors than the old-fashioned grease spot; and we have in the Lummer-Brodhun photometer head an excellent development in the right direction. This has an arrangement of prisms which enables one to observe and compare the light reflected from the two sides of a white porcelain disc in one visual observation; and I find that this instrument will distinctly indicate very minute variations in candle power long before any effect can be observed on a grease spot. Messrs. Hartman and Braun, of Frankfort, make a large photometer provided with this class of head, which has been adopted as a standard at the German National Laboratory at Charlottenburg. I do not, however, quite approve of the way of mounting this instrument, and I made slight modifications in the same—suspending the bars from brackets on the wall, &c. Among other things, I provided the tube on the photometer which serves for holding the gas-burner with a Thorpe's indicator, which shows approximately the flow of gas. From the above, you will see that the only appliances required outside what is generally found in any laboratory are the photometer and gasholder. The photometer is, of course, useful for other purposes, although its employment may not be very extensive in analytical practice. The actual cost of this apparatus is, when constructed on my plan, about £25, which is not very much out of the way.

With reference to the other determinations to be made, I can only recommend certain methods. For determinations of volatile matter, take a small crucible, and enclose it in a larger one, surrounding the little crucible with finely powdered charcoal; then heat the whole to a bright red heat, and take the loss as volatile matter. The results agree far better than those obtained when heating direct over a burner in a platinum crucible. For instance, in two determinations of the same cannel coal, I got 34·6 and 35·2 per cent. of volatile matter. A slightly higher result would, of course, be obtained by increasing the temperature; but, expressed as a percentage of weight, the gas evolved beyond a bright red heat is very inconsiderable. I must remark, however, that the heating must be continued for a considerable time. Constant weight is obtained only after a couple of hours' heating. The determination of ash is, of course, well known to all of you, and also the fact that hygroscopic water has to be determined by direct weighing of the water. The determination of the specific gravity of a coal is of great importance, and no other than the pycnometer method is sufficiently accurate. It is also to be recommended to put the pycnometer under the receiver of an air-pump, in order to take away gas bubbles adhering to the particles of coal. I mention this as some classes of coal when heated in water give off a certain amount of soluble substance. The sulphur can be determined by heating with mixed carbonates of potash and soda in a roomy platinum crucible, using a large excess of the reagents, and heating over a small luminous flame for at least 1½ hours before increasing the heat to any considerable extent. The ordinary method of using lime in the combustion-tube can also be employed. The results of the two methods agree well; but in both cases care has to be taken against quick heating. The analysis of the coal gas produced can be carried out according to the choice of the analyst himself.

I find that, by adhering to the instructions given above, results are obtained agreeing with practical working exceedingly closely, and closer by far than the results obtained in the small furnaces with iron retorts ordinarily used in gas-works. With this latter apparatus, it has always been the case that the analyst has found a smaller quantity of gas of a higher illuminating power than that which is obtained in practice. This no doubt depends upon the fact that the heat used is not intense enough for driving out the last traces of gas. Working on the lines I have laid down, I arrive at a slightly larger quantity of gas of approximately the same illuminating power as that obtained in practice; this depending upon the fact that the temperature of the small injector furnace can be raised to anything practicable.

In the discussion which followed the reading of the paper, several speakers who had had considerable experience in analyzing and testing gas coals for illuminating purposes, both in the laboratory and also in the works, expressed an opinion that laboratory methods are practically valueless from a gas manager's point of view. The only practical method of testing coal intended to be contracted for in large quantities was by passing from 50 to 100 tons through the works. It was thought that Mr. Rhodin's apparatus would give too low results, both as regards the quality and quantity of gas, on account of the large condensing area. Having to start with a cold retort which had to be heated gradually would result in condensation of the rich benzol products—the toluene and naphthalene—which ought to go into the gas. Dr. J. Grossmann explained that Mr. Rhodin had described a laboratory method for the analysis of a number of samples of coals. They all knew that analyses contained in text-books did not always give the same results; but they were considered to be near enough for comparative purposes. He expressed his disappointment that Mr. Rhodin had not shown in his paper in what respect his method agreed with, or differed from, the old methods, and how much closer would be the result obtained by the same coal on a large scale. If Mr. Rhodin could give the figures, they would be exceedingly useful. Mr. Rhodin, in reply, said that he only wished to show one method whereby research could be made which was less cumbersome than so-called laboratory methods; and he maintained that by his method better results could be obtained than by a retort which contained 1 kilogramme. All he attempted to do was to reduce the present "laboratory" methods to a smaller scale. Everybody knew that it would not represent large quantities of coal, but it would give some idea of the quality of the coal under examination. He contended that, the small apparatus being made of glass, the heat carried to the gas would go down to the lower temperature very gradually. He could not answer the points raised on the technology of the gas manager, nor put before the meeting an analysis which he had been making for others; but he would furnish on some future occasion the figures required.

Coal in Western Australia.—According to a cablegram just received from Perth, Western Australia, the result of the sinking of a drill on the property of the Collie Coal Trust Development Company, Limited, has been the discovery of three magnificent seams of coal—one 4 ft. 11 in., at a depth of 301 feet, another 3 ft. 9 in., at a depth of 323 feet, and a third 4 ft. 9 in., at a depth of 411 feet.

Manchester District Institution of Gas Engineers.—The thirtieth annual meeting of this Institution will be held at the Grand Hotel, Manchester, next Saturday. According to the circular issued by the Hon. Secretary (Mr. S. S. Mellor, of Northwich), the business will consist of the election of one new member, the reception of the Committee's report and the statement of accounts, the election of office-bearers, and the delivery by Mr. T. N. Ritson, of Kendal, of his Inaugural Address.

Electric Incandescent v. Auer Incandescent Gas-Lamps.—The electric incandescent lamp and the Auer incandescent gas-lamp were recently compared for effect and economy in the "Giornale Scientifico." For economy in illuminating, the latter is found superior; but the life of a mantle is stated to be considerably less than that of an electric incandescent lamp. Figures are given showing the percentage loss of candle power of two English and three German mantles, after burning 100 and 500 hours; the means of these being respectively 15 and 45 per cent. For the loss of light in electric lamps, the author gives 20 per cent. after 500 hours as a practical figure, taking perfect and faulty lamps together.

BRITISH ASSOCIATION OF WATER-WORKS ENGINEERS.

The members of the Association held their half-yearly meeting last Saturday, in the Geological Society's Rooms, at Burlington House, W. The PRESIDENT (Mr. William Watts, of the Little Don Water-Works, Sheffield) occupied the chair; and a considerable number of gentlemen from other Societies were present by invitation for the purpose of ascertaining their views on the principal subject entered on the *agenda* for consideration.

CONFIRMATION OF MINUTES.

The proceedings commenced by the SECRETARY (Mr. Percy Griffith) reading the minutes of the meeting held in London in June last; and on the proposition of Mr. C. H. PRIESTLEY (Cardiff), seconded by Mr. R. H. SWINDLEHURST (Bolton), they were confirmed.

NEW OFFICE-BEARERS AND ADDITIONS TO THE ROLL.

Messrs. Shaw and Wells were appointed Scrutineers of the balloting-lists. They subsequently reported that the following gentlemen had been selected to take office:—

President.—Mr. C. H. Priestley, of Cardiff.

Vice-Presidents.—Mr. W. A. Richardson, of Birkenhead, and Mr. Frederick Griffith, of Leicester.

Members of Council.—Messrs. C. E. Jones, W. A. Paskin, H. Roberts, C. Sainty, E. Sandeman, R. H. Swindlehurst, W. Terrey, E. A. B. Woodward, F. J. Bancroft, and W. Millhouse.

Hon. Secretary and Treasurer.—Mr. W. G. Peirce, of Richmond.

The following additions to the roll were also reported:—

Members.—Mr. Arthur Andrew, of Oldham; Mr. G. Cochrane, of London; Mr. Augustin Gonzalez, of Buenos Ayres; Mr. G. W. Lacey, of Oswestry; Mr. W. H. Morris, of Cavan; Mr. G. E. Vint, of Holmfirth; Mr. W. H. Wood, of Banbury.

Associates.—Mr. C. Aburrow, of Johannesburg; Mr. F. A. Carter, of Newport; Mr. W. F. H. Creber, of Cardiff; Mr. A. E. J. Hubbard, of Lowestoft; Mr. J. H. Parkin, of Kendal; Mr. A. Riley, of Fleetwood; Mr. B. E. F. Sheehy, of Limerick.

The PRESIDENT announced that Mr. Priestley had cordially invited the Association to receive the hospitality and kindness of Cardiff at their summer meeting, which would probably be held as soon as possible—probably the first week—in July. They had elected on this occasion members and associates to the number of fourteen; and he might take this opportunity of saying that the Association now, with the elections that day, represented about 220 towns in the country. They had on their books 235 members and associates; so that he thought this spoke well for the success of the Association, which was also in a good financial position.

THE NATION'S WATER SUPPLY, AND ITS EFFECTIVE CONTROL.

Mr. C. E. JONES (Leyton) read a paper on the above subject; and it evoked a long and animated discussion, in which the views of at least twenty-five gentlemen (many of them visitors) were elicited. The paper, with an epitome of the debate, will be given in next week's issue.

Before the members separated, votes of thanks were accorded to the delegates who had attended from various Societies, to the Geological Society for the use of their rooms, to Mr. John Shaw for auditing the accounts, and to Mr. De Rance for his gift of books and pamphlets.

COVERED RESERVOIR CONSTRUCTION IN THE UNITED STATES.

At the last Meeting of the Boston Society of Civil Engineers, a paper was read by Mr. FRANK L. FULLER on the above subject, in which he gave an account of several covered reservoirs constructed under his direction. It has since been printed in the "Journal of the Association of Engineering Societies," and the following abstract appeared in a recent issue of the "Engineering Record."

In 1895-6, a covered reservoir was constructed at Winchendon (Mass.) for the storage of underground water. The plans were prepared in 1889; but the work was not put in hand. The reservoir has an internal diameter of 69 feet at the bottom and 71 feet at the top; the depth of water being 17 ft. 8 in. The wall is of rubble masonry, 5 feet thick at the bottom and 2 ft. 6 in. at the top. The total height of the wall is 21 feet; 2 feet being below the bottom of the reservoir. The capacity to the high-water line is about 504,000 gallons. Two sets of 12 in. by 16 in. brick piers, laid in Germania portland cement mortar, and connected by lintel arches, support two rings of brickwork, which, in turn, support the concrete dome at the centre and two circular concrete covering arches. The brick rings are 12 inches, and the concrete roof is 8 inches in thickness. An embankment surrounds that part of the masonry wall which is above the original surface of the ground; and the filling is extended over the roof, and properly graded and seeded to grass. Test pits were sunk at the site, in order to ascertain the location and depth of the ledge, which was known to exist. It was found impossible to entirely avoid this ledge; and considerable rock excavation was required at the bottom on the westerly side. The rubble masonry wall was begun in April, 1896. The core was left until the wall had been built, when it was removed and placed in layers, wetted, and rammed about the back of the wall. This was built of local rubble stone; and considerable difficulty was experienced in obtaining stone of suitable quality. The ledges in the vicinity were found to be unfit; and the wall is largely composed of split field boulders. At the top of the wall a skewback was cut, from which to start the outer concrete covering arch. A derrick and hoisting-engine were used in making the excavation and laying the wall. The ledge was excavated to a sufficient depth to allow of 6 inches of concrete being placed on the bottom. It was more or less disintegrated, and but little of that removed was fit for use in the wall. All piers rest on solid ledge or on large granite blocks firmly bedded in the bottom. The piers are laid in portland cement mortar; the lintel arches connecting them and the spandrel filling between them being of American cement brick work 12 inches thick. The covering arches and the dome at the centre are of portland cement concrete 8 inches thick. The proportions were one of cement, two of sand, and five of broken stone not more than 2 inches in its longest dimension. Centring for the entire roof was put in place before any concrete was used. Before the dome or the covering arches were started, the embankment about the masonry wall was raised to the top of the wall and thoroughly rammed; thus assisting the wall to resist the thrust of the arches. The concrete was put in place in sections bounded by radial lines. The positions of these sections of covering arches and dome were such that they were on radial lines extending entirely across the reservoir from circumference to circumference; thus tending to transmit any horizontal thrust to the rubble masonry wall. After the last of the concrete had been in place fourteen days, the wooden centring was removed; and the roof was found to be hard and smooth, and no cracks or settlements could be detected. At the centre of the roof is a ventilator consisting of an 8-inch cast-iron sphere perforated with ¼-inch holes. Entrance to the reservoir is had through a 26-inch manhole in the roof, on the top of which is placed a heavy cast-iron cover secured by a padlock. The soil on the top and sides of the reservoir was seeded to grass to protect the bank from being washed by the rains. A 6-inch vertical overflow-pipe connected with a waste-pipe of the same size prevents the reservoir from overflowing.

Water can be withdrawn from the reservoir by a 14-inch main only to within 6 inches of the bottom at the centre. All below that level must be drawn out through the 6-inch waste-pipe, which can be done by opening a 6-inch gate in the bottom of the reservoir. This arrangement prevents any sediment from entering the distribution system. The 6-inch waste-pipe passes through the bottom of the reservoir with a slight inclination, and comes to the natural surface of the ground a few hundred feet below the reservoir. On account of the large amount of ground water in the soil, a hole was made in the 6-inch cast-iron waste-pipe, so that it acts as a drain for reducing the level of the ground water under the reservoir, and prevents any upward pressure on the bottom when the reservoir has been emptied. There is also a 2-inch composition pipe set vertically in the concrete bottom, making direct connection between the space under the concrete bottom and the reservoir. This pipe is about 1 foot long, and at the top has an elbow, and on it a check-valve opening towards the reservoir. In case the water in the reservoir is drawn lower than the outside ground water, this check-valve will open, and the ground water flow into the reservoir, so that no pressure can be exerted on the concrete bottom. An under drain, composed partly of 4-inch Akron pipe, laid with open joints, and partly of broken stone, is laid on the inside of the masonry wall, and just below the under side of the concrete bottom. This collects the ground water, and brings it near the point where the 6-inch cast-iron waste-pipe passes through the wall. The sides and bottom received carefully applied plaster and brush coats of portland cement, and the reservoir is practically water-tight. The cost of the reservoir, as shown by the final estimate of the contractor, was $8218.

In 1891, a circular covered reservoir was built for the water-works of Franklin (N.H.), from the design made for the reservoir above described. It is 69 feet in diameter at the bottom, and 71 feet at the top. The height from the bottom to the springing is 19 ft. 6 in. The brick piers supporting the roof measure 12 in. by 12 in., and were laid in portland cement mortar. The roof is of brick masonry, laid in Rosendale cement mortar, and is 8 inches thick. The average load at the base of each pier is a little less than 23 tons per square foot. The cost of this reservoir, as shown by the final estimate, was $9032.

In 1893, a covered masonry reservoir with a capacity of 1,013,000 gallons was built by the town of Methuen (Mass.). It is similar in design to the Franklin reservoir, but has an inside diameter of 95 feet at the top and 93 feet at the bottom. The piers are also larger, and the reservoir is deeper. It is practically an enlargement of the Franklin reservoir by the addition of another circular covering arch of the same span and rise. The roof is supported by 60 brick piers, 16 inches square, laid in portland cement mortar. The dome and covering arches are of brick, 8 inches in thickness, laid in Rosendale cement mortar. The average load per square foot at the base of each pier, including a possible load on the roof of 50 lbs. per square

foot for snow and ice in winter, is about 14·1 tons. The height of the middle row of piers from the bottom of the reservoir to the springing line of the lintel arches is 18 ft. 3 in. The piers are 7·54 feet apart on centres, measured along the circumferences of their respective circles. Most of the work was done by day labour; and the total cost of the reservoir, exclusive of land, was $16,864.

At Monson (Mass.) there is a circular covered reservoir used in connection with the water supply for the Massachusetts Hospital for Epileptics. It is 39 feet in diameter at the bottom and 41 feet at the springing line of the roof, which is 20 feet above the bottom. When full, the water is 19 feet deep, and the reservoir contains 178,000 gallons. The bottom of the excavation for this reservoir was entirely in rock. The wall is 4 ft. 6 in. thick at the bottom and 2 ft. 6 in. at the top. It was built of rubble masonry laid in mortar composed of one part of Hoffman cement and two parts of sand. When the rubble masonry wall had been carried to an elevation a little below high-water level, a band made of two plates of soft steel, each 12 inches in width by ½ inch in thickness, was riveted together in place on blocking, so as to enclose the wall when completed. The band was 46 feet inside diameter, and was made of ten plates, each about 29 feet in length. The plates break joints, and have a splice plate on each side. That on the continuous side is 24 in. by 12 in. by ¼ in. in thickness. That on the other side is of the same size, but ½ inch in thickness. Each of the joints has 26 rivets ⅞ inch in diameter. There is a rivet at every 3 feet between the joints. One coat of boiled oil was applied at the shop, and two coats of red lead after the band was in place. After the paint was dry, the wall was completed inside the band, and the band enclosed in masonry or concrete to protect it from rusting. The object of the band is to resist any thrust caused by the action of the concrete roof, which has a diameter of 41 feet and a rise of 4 feet. The concrete is 10 inches in thickness at the springing line, and decreases to 8 inches at the centre. It was put in place on accurately and thoroughly built wooden centring, covering the entire reservoir. The centring was supported on large chestnut posts, which rested on a set of hardwood wedges, which were driven out when the centring was removed. The boarding of the centre was of good quality planed spruce, tongued and grooved. The concrete was composed of one part, by measure, of Alsen portland cement, 2½ parts of good sand, and 4½ parts of broken stone not over 2 inches in its longest diameter. It was thoroughly mixed as dry as could be well rammed, and put in place as quickly as possible. The amount required for the roof was about 40 cubic yards. The work was begun about 10 o'clock in the morning on Nov. 4, 1897, and completed at noon the next day, or in twelve working hours. As soon as the concrete had begun to set, it was covered with 5 or 6 inches of earth to prevent freezing. Afterwards about 2 feet thickness of soil was put on in the centre, increasing to about 3 feet at the circumference. An embankment was also built about the part of the masonry wall above the natural surface of the ground. On Dec. 3, 1897, the wedges under a number of the posts supporting the centring were removed; but there appeared to be no settlement of the concrete roof. On Dec. 24, the entire centring was removed; and the concrete roof appeared hard and smooth. No settlement occurred, and no cracks could be discovered. The masonry wall was then carefully pointed up, and a ½-inch plaster coat, composed of equal parts of Alsen portland cement and sand, was put on. The object was to make the reservoir as nearly water-tight as possible. Later the wall was gone over with a brush coat of neat portland cement in the form of a thin paste.

In building the masonry wall, great care was taken to leave no voids, and to have a wall of solid stone and mortar (preferably with as much stone and as little mortar as possible), and still have all the joints filled. No stone was allowed to extend entirely through the wall, as this would form a continuous joint along which the water might escape. At the point where the 8-inch outflow-pipe and the 6-inch waste-pipe enter the reservoir, the wall is carried somewhat deeper, and is carefully built under and around the pipes. Cast-iron flanged sleeves are secured to both pipes by a lead joint at the centre of the wall, to prevent the water following the outside of the pipe through the wall. On the 6-inch waste-pipe, nearly under the manhole, is a 6-inch T, in which is placed a 6-inch pipe with the upper end at high-water level. On the inner end of the 6-inch waste-pipe is a 6-inch gate, which is closed except when draining the lower part of the reservoir. The outer end of the waste-pipe comes to the natural surface of the ground about 170 feet from the centre of the reservoir.

Considerable ground water was found in the excavation. In order to relieve the bottom from an upward pressure when the reservoir is empty, the bottom of the excavation was under-drained by placing a layer of broken stone over the top of the ledge. By means of 4-inch Akron drain-pipe, the ground water is brought together under the concrete bottom, and passes through the footing course of the masonry wall and out to the natural surface of the ground through a 4-inch cast-iron pipe. Outside the reservoir is a 4-inch gate on the 4-inch cast-iron drain-pipe. By closing this gate, the flow of the ground water from around and under the reservoir is checked; and it will rise to such a level outside the reservoir wall that it will escape at some point. If the reservoir is emptied when the outside water is above the level of the bottom, as before mentioned, there will be an upward pressure on the bottom, which will tend to push it in. To relieve this upward pressure when the reservoir is empty and the gate on the drain-pipe closed, two 2-inch composition pipes, with check-valves similar to that mentioned in connection with the Winchendon reservoir, are provided. The cost of this reservoir was $5644, exclusive of the steel band, which cost $248.

REGISTER OF PATENTS.

Prepayment Gas-Meters.—Whitham, C., and Large, E., of Oldham. No. 5708; March 16, 1899.

This invention in prepayment gas-meters consists of an improved construction or arrangement of mechanism for actuating the gas-valve and opening the gas-inlet by means of the coins inserted.

Fig. 1 represents a vertical section of the prepayment mechanism through the axis of the valve and spindle; fig. 2, a front view; fig. 3, a vertical cross-section of fig. 1; fig. 4, a section of the coin-carrier in the coin-delivering position, after operating the delivery-valve; fig. 5, a plan

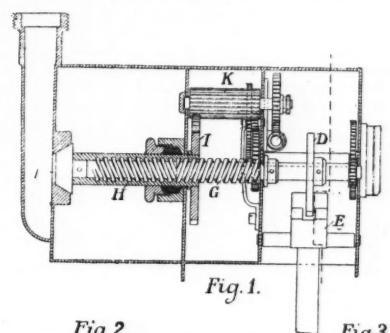


Fig. 1.

Fig. 2.

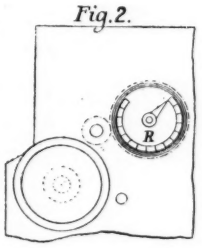


Fig. 3.

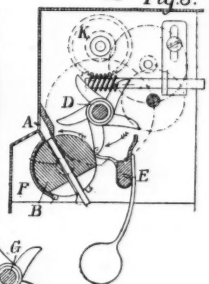


Fig. 4.

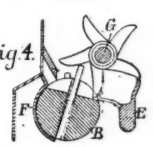
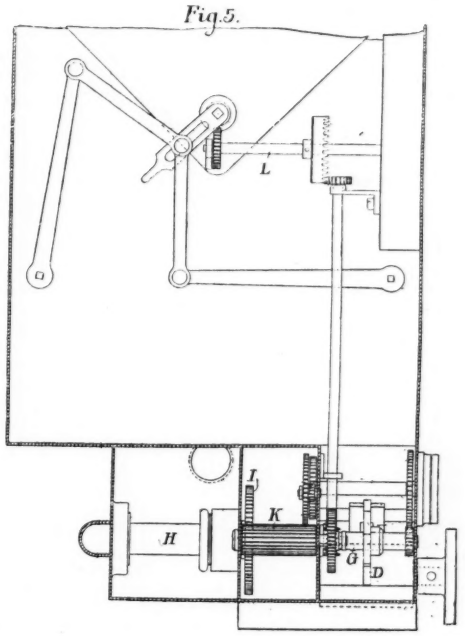


Fig. 5.



of the prepayment mechanism and gas-measuring chamber and index-mechanism. The mechanism is shown applied to a dry meter, but is equally applicable to a wet meter.

In the meter-case a slot and shoot A are arranged for the insertion of the coins, and below is a horizontal cylindrical coin-carrier B, fitted with

a knob or handle on a spindle projecting to the outside of the casing, with pegs on the cylinder abutting against suitable stops, so that the coin-carrier can be turned forward and backward between the stops for rather more than half a revolution. The coin-carrier is slotted through; the slot being of such length at the top side that the coin to be used with the apparatus (for instance, a penny) can drop into the slot, and of shorter length at the lower side so that a coin of the correct value does not drop through, while a smaller coin (a halfpenny, for instance) drops through into the cash-box. The diameter of the cylindrical coin-carrier is such that the coin, when level with the top side, projects on the under-side, as shown in fig. 3.

Parallel to the coin-carrier is a shaft carrying a spider D, with curved arms; and below the coin-carrier is pivoted a forked pawl E pressed upwards by a balance-weight or spring, and so formed that, while one prong or limb rests against the circumference of the coin-carrier, another prong is in the path of the tips of the arms of the spider. It is only a short distance from one of them; while the top of the preceding arm rests upon the surface of the coin-carrier—the spider thus being prevented from turning in the direction of the arrow in fig. 3 while the meter is delivering gas. When the coin-carrier is turned after the insertion of a coin, the projecting part of the coin first pushes one part of the pawl back, and another part out of the path of the spider-arm, and then seizes under the convex side of the arm and turns the spider—the upper part of the coin-slot passing under a cylindrical segment F fixed to the casing during this movement, so as to prevent the protruding part of the coin from being pushed back. When the spider has moved forward, the pawl drops back into its former position, and prevents the carrier being turned backwards; and it also arrests the movement of the spider beyond the position shown in fig. 4. The arm seized by the coin will then be in a position shown; and as the coin-cylinder is turned a little farther, the coin drops out of the slot into the cash-box below. If the coin should not drop out, it would project on the underside, and would catch against the cover F when the carrier was turned backwards; and unless it could be made to fall out by knocking it repeatedly against the cover, the meter would have to be opened. The coin-carrier is notched out at the side of the projecting coins, to allow the arms of the spider to pass. As will be seen in fig. 4, the next arm enters a little into this notch; and as the coin-carrier (after delivery of the coin) is turned back, the arm will also be turned back so as to rest against the cylindrical surface of the carrier in the same position as the arm in fig. 3—the spider being thus turned exactly by one arm or division for each coin paid in, even if the coin should be enlarged at the projecting side by hammering.

The spindle G of the spider is cut with a quick screw-thread, and a cylindrical nut H is placed thereon, having fixed to it at one end the gas-valve and at the other end a spur-wheel I engaging into a long pinion K, placed parallel to the spindle G, which pinion is rotated from the index-driving shaft L of the meter through a crown-wheel pinion and shaft. When gas is consumed, the nut turns in such a direction that it moves the valve towards its seating when the screw-spindle is stationary—that is to say, in the same direction as the spider is turned by the coin. The turning of the spindle by a coin inserted draws the nut and valve away from the seating; the nut being prevented from turning by the wheel I and pinion K. The gas enters from the inlet-pipe P through the valve-seating into a gas-tight chamber communicating with the inlet to the meter bellows or drum; and a stuffing-box is arranged for the cylindrical nut to pass through into this chamber. For each additional coin inserted, the valve is drawn further away from its seating; and in order to close it, the meter must deliver a quantity of gas corresponding with the number of coins inserted. When the valve is brought against its seating, the delivery of gas is stopped, even if there should be some leakage of the valve, as the friction of the valve on its seating will prevent the further rotation of the nut, and thereby arrest the motion of the index-driving mechanism and the bellows or drum of the meter. The worm-wheel on the spindle of the long pinion K is made exchangeable, in order to be able to vary the quantity of gas delivered for each coin.

If an attempt were made to insert a coin attached to a string, the arm on the spider could be partly moved round without letting the coin drop out of the coin-slot in the carrier; but the coin could not be withdrawn without moving the carrier back into its starting position. This could, however, not be done after the coin has passed the prong of the pawl E; while if the carrier were turned back before the prong has slipped off the coin, the arm would be pushed back into its starting position by the face of the notch.

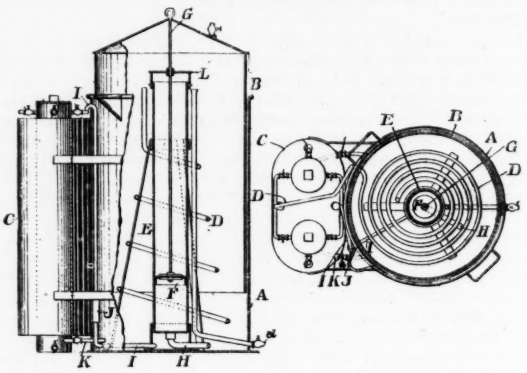
While gas is consumed, the friction of the screw-spindle G in the nut H tends to turn the spindle and spider in the same direction as it is turned by the coin; so that the arm in contact with the coin-carrier is held against it in the position shown in fig. 3, and the exact delivery of the predetermined quantity of gas for each coin inserted is assured thereby.

In order to enable the quantity of gas paid for, but not consumed, to be read at a glance, a rotatable dial R is geared with the spindle G, and an index-finger is geared with the long pinion K by means of a train consisting of a toothed-wheel pinion and spur-wheel. Each coin inserted is indicated upon the dial by the dial moving forwards one point; but as each coin's worth of the gas is passed through the measuring chambers the finger moves in the same direction as the dial, and reduces the indicated quantity upon it.

Acetylene Generators.—Leigh, H. H.; a communication from J. W. Carey, of Brisbane, Queensland. No. 23,988; Dec. 1, 1899.

The patentee provides a pump centrally within a gasholder tank; the bucket or plunger, as the case may be, being connected by a rod with the crown of the holder, while a suction-pipe or valve is connected either to draw from the holder tank or from a separate water supply. A delivery-pipe (fitted with a non-return valve) is led from the pump above the highest part of the generator, and turned into the carbide chamber in such a manner that the carbide is brought in contact with the water from the bottom upwards—thus allowing the damp gas given off to dry (by the absorption by the carbide of its moisture) as it passes up through the carbide contained in the upper divisions of the generator.

A is the gasholder tank; B the gasholder; C the generator with water-jacket; D the delivery-pipe coiled to increase the cooling surface; E the pump-shell; F the bucket or plunger; G the pump-rod or spear connecting it to the crown of the holder; H the suction-pipe and valve; I the delivery-pipe with valve J; K a pipe with tap provided for conveying water for starting the apparatus; and L a cover over the pump-shell used as a guide to steady the rod and holder.



The carbide is put in through the caps in the top of the generator, which having been done, a little water is admitted by means of the tap, through the pipe K, into the generator—thus causing (by the reaction of the water on the carbide) the immediate production of gas. Passing into the holder B, the gas causes it to ascend, and with it the plunger or bucket F; and, as the latter rises, it draws in water through the suction-pipe H. Then, when the production of gas ceases, or the consumption overtakes the supply, the holder falls, and the pump discharges the water through the delivery-pipe I into the generators, and causes the production of more gas, which in turn raises the holder. The apparatus thus works so long as there is any carbide in the generator.

Generating Acetylene.—Rouma, A., of Liége, Belgium. No. 24,364; Dec. 7, 1899.

This invention, relating to acetylene generating apparatus, has for its object to provide mechanism for automatically regulating the production of the gas by the fall of calcium carbide into water—the regulation of production proportionately to requirements, with regard to consumption, being effected by the rise and fall of the bell of a gasholder. The automatic liberation of the carbide is effected by employing two pins arranged upon a pulley actuated by the bell of the holder, one of which at the time of the rise of the bell draws a hammer, while the other during the descent of the bell pushes back the hammer, which, in its fall, strikes a lever operating the stopping pawl of the carbide distributor. In combination with this regulating mechanism, is a safety mechanism, consisting of a two-armed pivoting lever, controlled by a pawl, in such a manner that, when the latter disengages from a ratchet-wheel, the hooked arm of the lever falls into a tooth of the wheel.

APPLICATIONS FOR LETTERS PATENT.

2248.—Beese, R., "Hanging gas-burner for incandescent lamps." Feb. 5.
2252.—Potter, W. G., "Incandescent burners." Feb. 5.
2258.—Rowbotham, K. A. & W., "Gas and oil engines." Feb. 5.
2276.—Cloudsley, J. L., "Gas-meters." Feb. 5.
2288.—Duncan, W., "Water-meters." Feb. 5.
2300.—Stansfield, A., and Meters, Limited, "Prepayment gas-meters." Feb. 6.
2303.—Rowden, W. T., "Gas-engines." Feb. 6.
2308.—Sadtler, J. P. B., "Generating gas and water vapour for heating purposes." Feb. 6.
2337.—Le Mat, M., "Acetylene gas apparatus." Feb. 6.
2391.—Wood, W. T., "Burners." Feb. 6.
2414.—Darby, H., and Punchard, W. C., "Circular-flame gas-burners." Feb. 7.
2453.—Allen, C. E., "Driving any ordinary engine by gas or oil." Feb. 7.
2456.—Cruickshank, A., and Bryant, G. W., "Gas-stoves." Feb. 7.
2475.—Chandler, D. & S. B., "Condensation of gases." Feb. 7.
2476.—Simpson, S., "Incandescent burners." Feb. 7.
2590.—Kimball, R. D., and M'Kenzie, A. A., "Conduits for gas, water, and like pipes." Feb. 9.
2594.—Scott-Snell, C. & F. A., and The Scott-Snell Phillips Syndicate, Ltd., "Incandescent gas lighting or heating." Feb. 9.
2606.—The Victor Light Syndicate, Ltd., and Powers, V., "Acetylene generators." Feb. 9.
2627.—Craven, R. E. P., "Fluid pressure-actuating valves." Feb. 9.
2631.—Hervieu, G. A., "Generating acetylene." Feb. 9.
2632.—Beckmann, O., "Incandescent burners." Feb. 9.
2642.—Veillard, C., "Illuminating apparatus." Feb. 9.
2663.—Gibbons, W. P. & G. B. A., "Regenerative furnaces." Feb. 10.
2667.—Crane, R., "Valves for fluids and gases." Feb. 10.
2672.—Nielsen, R. A., "Incandescing media for lighting." Feb. 10.
2682.—Glover, J. G., "Torch for street lighting." Feb. 10.
2709.—Leroy, P., "Gas-generators." Feb. 10.

South London Local Authorities and the South Metropolitan Gas Company's Bill.—At the meeting of the Vestry of St. George-the-Martyr (Southwark) last Tuesday, the General Purposes Committee reported that their attention had been called to the provisions of the South Metropolitan Gas Company's Bill, and they recommended that a conference of Local Authorities in South London should be held with regard to the matter, and that in the meantime a petition be presented against the Bill. This was agreed to. The conference will take place on the 26th inst.

PARLIAMENTARY INTELLIGENCE.

PRIVATE BILLS (SESSION 1900).

HOUSE OF LORDS.

The following progress has been made with Private Bills:—

Bills presented and read the first time: Barnsley Corporation Bill, Bury and District Water (Transfer) Bill, East Shropshire Water Bill, East Stirlingshire Water Bill, Edinburgh District Lunacy Board Bill, Exmouth Urban District Water Bill, Falkirk and District Water Bill, Falkirk Corporation Bill, Glyncorrwg Urban District Council Gas Bill, Gwyrfai Rural District Council Water Bill, Hemel Hempstead Corporation (Water) Bill, Higham Ferrers Water Bill, Margate Corporation Bill, Menstone Water (Transfer) Bill, Morley Corporation Bill, Motherwell Water Bill, Mountain Ash Water Bill, Newtown and Llanllwchaiarn Urban District Gas Bill, Otley Urban District Council Water Bill, Paignton Urban District Water Bill, Ramsgate Corporation Improvements Bill, Rotherham Corporation Bill, Salford Corporation Bill, South Essex Water Board Bill, Walsall Corporation Bill.

Bills presented, read the first time, and referred to the Examiners: Bristol Water Bill, Cleethorpes Gas Bill, Dorking Water Bill, Exmouth and District Water Bill, Fishguard Water and Gas Bill, Great Berkhampstead Water Bill, Kingston-upon-Thames Gas Bill, London Sea Water Supply Bill, Newport (Mon.) Gas Bill, South Essex Water Bill, Westgate and Birchington Water Bill.

Bills read a second time: Bury and District Water (Transfer) Bill, East Shropshire Water Bill, East Stirlingshire Water Bill, Edinburgh District Lunacy Board Bill, Falkirk and District Water Bill, Hemel Hempstead Corporation Water Bill, Higham Ferrers Water Bill, Margate Corporation Bill, Menstone Water (Transfer) Bill, Morley Corporation Bill, Motherwell Water Bill, Mountain Ash Water Bill, Newtown and Llanllwchaiarn Urban District Gas Bill, Otley Urban District Council Water Bill, Paignton Urban District Water Bill, Ramsgate Corporation Improvements Bill, Rotherham Corporation Bill, Salford Corporation Bill, South Essex Water Board Bill.

Petitions have been presented against the Mountain Ash Water Bill and the Rotherham Corporation Bill.

HOUSE OF COMMONS.

The following progress has been made with Private Bills:—

Bills presented and read the first time: Aberdeen Police and Improvement Bill, Airdrie, Coatbridge, and District Water Trust Bill, Bradford Corporation Bill, City of London (Various Powers) Bill, Dublin Corporation Bill, Gaslight and Coke, Commercial Gas, and South Metropolitan Gas Companies Bill, Glastonbury Corporation Gas Bill, Halifax Corporation Bill, Hamilton Burgh Bill, Hastings Corporation Bill, Ilfracombe Improvement Bill, Lea Conservancy Bill, London Water (Purchase) Bill, London Water (Welsh Supply) Bill, Morecambe Urban District Council (Gas) Bill, Oldham Corporation Bill, Ossett Corporation Gas Bill, Scarborough Corporation Bill, Southport Extension and Tramways Bill, Spalding Urban District Council (Water) Bill, Taunton Corporation Bill, Tottenham Urban District Council Bill, West Bromwich Corporation Bill, Woodbridge District Water Bill.

Bills presented, read the first time, and referred to the Examiners: Bedford Gas Bill, British Gaslight Company (Staffordshire Potteries) Bill, Chelsea Water Bill, East London Water Bill, Gaslight and Coke Company Bill, Glastonbury and Street Gas Bill, Grantham Gas Bill, Hartlepool Gas and Water Bill, Lambeth Water Bill, Maidenhead Gas Bill, Metropolitan Water Companies Bill, Mid-Kent Water Bill, North Warwickshire Water Bill, Ossett Gas Bill, Redhill Gas Bill, Rickmansworth and Uxbridge Valley Water Bill, Rugeley Gas Bill, St. Albans Water Bill, South Metropolitan Gas Bill, Southport Water Bill, Wandsworth and Putney Gas Bill, Wetherby District Water Bill, Wolverhampton Gas Bill.

Mr. Pickersgill and Mr. Lough have blocked the Gaslight and Coke Company Bill; Mr. Whitmore and Mr. Goulding, the Welsh Water and Purchase Bills of the London County Council; and Sir F. Dixon-Hartland has taken a similar course with respect to the Welsh Water and Rickmansworth and Uxbridge Valley Water Bills.

Petitions have been presented against the Dublin Corporation Bill and the Hamilton Burgh Bill; also against the London Water (Purchase) Bill and the London Water (Welsh Supply) Bill from the Vestry of the parishes of St. Margaret and St. John, Westminster, and from the Middlesex County Council in respect of the former Bill and the Metropolitan Water Company's Bill.

LEGAL INTELLIGENCE.

HIGH COURT OF JUSTICE—CHANCERY DIVISION.

Thursday, Feb. 15.

(*Before Mr. Justice* BUCKLEY.)

The Welsbach Incandescent Gas-Light Company v. The New Sunlight Incandescent Company.

Judgment was this morning delivered in the above-named action.

Mr. FLETCHER MOULTON, Q.C., Mr. T. TERRELL, Q.C., Mr. ROGER WALLACE, Q.C., and Mr. WALTER appeared for the plaintiffs; Mr. BOUSFIELD, Q.C., and Mr. NEIL represented the defendants.

Justice BUCKLEY having stated the nature of the case, said the defences raised were non-infringement, non-utility, and incomplete description of the nature of the alleged invention in the complete specification. There was no plea of non-patentability or a want of subject matter. Before dealing with the merits, he must dispose of the point raised by defendants' Counsel at the conclusion of the plaintiffs' case—that no evidence had been given of the manufacture or use of the mantles complained of. It was true that no evidence had been given on either of these points; but answers to interrogatories had been put in which, in his opinion, amounted to an admission of manufacture. Having read the interrogatories and answers to support this view, his Lordship proceeded to deal with the facts. Down to 1885, he said, incandescent lighting was practically confined to throwing on a solid body—such as a block of magnesium—an exceedingly hot flame. The most familiar example of this was the lime-light. But in the year 1885, Dr. Welsbach took out a patent which was, in fact, the creation of the modern system of incandescent gas lighting. This patent embraced two matters—first, the mode of forming the body which was to be rendered incandescent; and, secondly, the selection of the materials to be employed. After describing the process of making the mantles, his Lordship said by this means a body of excessive tenuity was obtained; and its fragility, while in one sense its weakness (because the body was liable to be destroyed by the impulse or energy of the flame in which it was bathed), was in another sense its strength (because its tenuity enabled it to bear excessive ranges of temperature without breaking). The materials to be employed were zirconia, lanthia, yttria, &c., in certain proportions. He then read from the specification and the claim, which was "the manufacture, substantially as herein described, of an illuminant appliance for gas and other burners, consisting of a cap or hood made of the fabric and impregnated with the substances mentioned, and treated as set forth." The claim therefore was duplex; it was both for the formation of the appliance and for the materials employed in constructing it. The provisional specification was dated Dec. 12, 1885; and the complete specification, March 15, 1886. But before the latter was filed—viz., on March 13—and therefore before the public had been informed of the nature of the invention, Mr. Imray, on a communication from Dr. Welsbach, applied for a further patent, which was the one on which the present action was brought. Shortly stated, this patent was for the use of certain substances other than those mentioned in the previous patent, which could be advantageously employed in producing an illuminating appliance the substance of the 1885 patent. It was impossible to introduce these further substances into the patent of 1885, because they were not included in the provisional specification. As usual, in cases of this description, a question arose as to the true construction of the specification. It commenced by referring to the provisional specification of 1885, because at the date of the application the complete specification of 1885 had not been filed. After reciting the effect of this provisional specification, it went on to say that Dr. Welsbach, continuing his researches, had found that certain other substances could be advantageously employed. Then the specification gave certain prescriptions—nine in number—for making an illuminating cap or hood, and also said that for impregnating the fabric solutions of the salts of the metals were employed as described in the previous specification. But it was not necessary that all the substances should be in solution; some of the salts might be in a pulverulent, amorphous, or finely divided condition, and might be mixed with the solution of salts so as to produce a thickish liquid in which the undissolved salt was suspended, and that with this liquid the fabric could be repeatedly soaked. It then gave certain variations which might be introduced into the process—the omission of the treatment with ammonia—and claimed: "In hoods prepared as illuminating appliances for burners, the use of oxide of thorium alone or in admixture with the oxides of zirconium, lanthanum, yttrium, neodymium, erbium, magnesium, or aluminium, substantially as herein described." This claim did not extend, as the claim of the 1885 patent did, to the manufacture of the form of the illuminant appliance, as distinguished from the use of certain materials in the formation of the illuminant appliance. It was a claim for the use of the oxides of certain rare earths in hoods prepared as illuminant appliances. The words at the end of the claim "as herein described" were, in his judgment, to be read as qualifying the words "the use of," and not as extending also to qualify the word "prepared." The patent of 1885 had described how to prepare the appliance in the sense of producing its form; and the patent of 1886 made no claim to any new invention or improvement in that respect. The claim for the use of the materials in the patent of 1886 was restricted to the use of the materials in respect of hoods or mantles, but was not restricted to their use in respect of hoods or mantles formed in a particular way. The substance of the prescriptions appeared to be this: The discovery was that a substance called thorium oxide, either pure (which was the word in the first prescription) or mixed with the oxides of certain rare earths (as in the subsequent prescriptions), made a hood of which the inventor said that in each case it had a certain quality. In the one case, it was rigid when incandescent; in other cases, it was flexible, or very flexible, when incandescent; and in others, that it gave certain colours. Having given the prescriptions, the inventor went on to say that it was better to avoid the use of certain substances, as hoods containing them were not so durable as those from which they were absent. In his judgment, the claim made was substantially the use of thorium oxide, alone or in admixture with certain other rare earths, as the means of obtaining hoods which had particular characteristics—such as rigidity, flexibility, or durability. The claim was not to a process producing a hood whose advantage resided simply in brilliancy, but one which had other qualities combined with that—viz., rigidity, flexibility, or durability. With regard to the word "pure" in the first prescription, he thought it was used, not as describing thorium oxide free from every impurity, but pure in the sense of the oxide alone, as distinguished from the oxide in admixture with other oxides. The word "pure" was found nowhere else in the specification; and in the claim, the words were oxide of thorium alone or in admixture. Next came the question, What was the meaning of thorium oxide, in this specification? In 1886, thoria was a rare earth which had been for many years known to chemists, but was of no known use to any human being. It had been analyzed, and was to a large extent known; but pure thorium in 1886 was a thorium which, with the knowledge of to-day, a chemist would call impure. From subsequent investigation, chemists now knew that what was regarded in 1886 as thorium was not thorium alone, but thorium with the admixture of an exceedingly small quantity of cerium and certain other impurities. It had been proved that the methods of purification remained the same to-day as they were in 1886; and it

would have been possible at that time, by spectroscopic examination, to have arrived at the result that what was regarded as pure thorium, in fact contained about 0·25 per cent. of impurities. A spectroscopic examination, however, was not the process which a chemist would employ in 1886 in his laboratory for the purpose of arriving at pure thorium. No one knew then, as was known now, that cerium had an extraordinary quality of adhering closely to thorium; and that to remove a very small percentage of cerium from thorium required repeated purification. He considered it proved that in 1886 thorium which contained so small a proportion as 0·25 per cent. of impurity, would by any chemist have been regarded as pure; that the prescription was to be read in this sense; and that pure thorium oxide in No. 1 would include thorium containing a small percentage—such as 0·25—of impurity, including 0·05 of cerium. Subsequent knowledge had proved the extraordinary fact that, while really pure thorium oxide produced a mantle of low illuminating power, the addition of a very small percentage of cerium raised the illuminating power in a most remarkable degree; 1 per cent. of cerium giving 18 to 20 candles, ¾ per cent. 14½ candles, ½ per cent. 13 candles, 0·2 per cent. 10 candles, and 0·1 per cent. 5·3 candles, while pure thorium only gave 1·3 candles. The defendants said that, inasmuch as the illuminating power of ordinary coal gas burned in the usual way was 3 candles, and the mantles produced under the 1885 patent gave 4 or 4½ candles, the patent of 1886 was not an improvement at all, but a falling off. To this, there were two answers. First, the 1886 patent did not claim to be an improvement on the patent of 1885, but to give a useful choice. Secondly, if the matter had to be tested by the value of the mantle as an illuminating appliance alone, the contention might be well founded; but there were advantages other than brilliancy to be considered – such as rigidity, flexibility, and durability—and experience had shown that the thorium mantle was tougher and stronger in use than any other mantle which could at present be prepared. To have a mantle of sufficient strength, was a matter of very great importance. To attain the maximum incandescence, it was desirable that the mantle should remain bathed in the hottest part of the flame. Some mantles became deformed in use, by contracting or falling out of shape when exposed to an exceedingly high temperature; and the thorium mantle had the advantage of being less deformed by use. This advantage might be set against the disadvantage that, with pure thorium, the illuminating power was small. It was now known, however, that if 1 per cent. of cerium were added to the pure thorium, one obtained not only the strength and stability of the thorium mantles, but a light of from 18 to 20 candles. Utility, in patent law, as he understood it, did not mean either abstract utility, comparative or competitive utility, or commercial utility. It had been described by Mr. Justice Grove, in *Young v. Rosenthal*, as meaning "better than the preceding knowledge of the trade as to a particular fabric;" and he would adopt this, if the word better were understood as meaning better in some respect, and not necessarily better in every respect. A cheaper article might be better in point of cost, though not better in point of quality. An invention was patentable which offered the public a useful choice; and the patent of 1886 offered an opportunity of making, with thorium, an appliance which up to that date it had been suggested could only be made with zirconium, lanthanum, or yttrium. The amount of these rare earths to be found on the surface of the globe was in some cases very limited. Until the importance of thorium was known, it was supposed to exist only in extraordinarily small quantities; and it was not until recently, after a great deal of exploration, that there had been found a large bed of monozite sand which contained thorium. A very small amount of utility was sufficient to support a patent; and the suggestion of the use of this rare earth as a means to an end, was enough in the present case. Again, it was not a question whether the patent of 1886 was or was not an improvement on that of 1885, not whether the 1886 patent enabled the public to make illuminating appliances better than they could under the 1885 patent, but whether it gave the public a useful choice of another substance to be employed in making illuminating appliances. The defence of non-utility, therefore, failed. Turning to the question of infringement, his Lordship again read the answers to interrogatories, and the analysis of the mantle. He said the defendants laid stress on the fact that the mantle as sold contained 9·56 per cent. of oxide of calcium; and Professor Dewar was pressed whether this fact would not bring the mantle within prescription No. 2, rather than No. 1. He answered that if the calcium were assumed to be non-volatile, it would be so; but it was admitted that when the mantle was used the oxide of calcium rapidly became volatilized, and then it practically consisted mainly of 99 per cent. of thorium and 1 per cent. of cerium. In Professor Dewar's view, such a mantle came substantially within prescription No. 1; and he thought this was the true view. For the purpose of this part of the case, it did not signify whether the 1 per cent. other than thorium was something useful—such as cerium—or something which neither improved nor deteriorated the mantle. Then it was insisted that defendants' method of producing the fabric was essentially different to that of the plaintiffs; and that therefore, even if the materials used were the same, they were outside the patent. In his opinion, this was not so. Defendants said their process was substantially the same as the one used by Clamond in the construction of his baskets; but he did not see that this was material. Plaintiffs were not now insisting on the process which produced the form which was under the patent of 1885, which had now expired; and defendants were entitled to use it. The substance of the matter seemed to him that defendants produced an illuminating appliance by using the material—namely, thorium – suggested by the patent of 1886, and substantially in the proportions suggested by that patent; and in so doing, he thought they had infringed the patent. He need say but little on the defence raised—based on an allegation that the specification did not so describe the invention as that the results described could be obtained by following the directions given. He was satisfied on the evidence that this defence could not be maintained. Professor Dewar and Mr. Ballantyne had made mantles by following each of the prescriptions, and had given the results. On the question of what relief should be given, he had been pressed to grant an injunction; but he did not see his way to do so. The only evidence of infringement against the defendants was the admission in the answers to interrogatories; and they there stated that they did not intend to make in future. In the second place, the patent would expire in a few weeks. A third consideration was this: The defendants said that their successors in business were making and selling, and he understood that, in point of fact, the defendant Company had been wound up and their business transferred to another Company, who were not a party to this action. It was suggested that the natural persons who were also named as defendants were, in fact, the Directors and officers of the new Company, and that if he restrained them he would in substance be restraining a defendant who was not present—viz., the new Company—in an indirect form. Why the plaintiffs did not amend by adding the new Company as a defendant, he did not know; but they did not, and the new Company were not before him. Under these circumstances, it appeared to him that he ought not to grant an injunction. Damages were asked; and it followed from what he had said that there must be an inquiry as to damages. The plaintiffs were also entitled to an order for the delivery up or destruction of all infringing mantles. With regard to the costs, the plaintiffs having obtained in a previous action a certificate that the validity of the patent had been called in question, under section 31 of the Act of 1883, a certain result ensued, unless he saw reason to certify to the contrary. He did not find any reason why he ought to deprive the plaintiffs of the benefit of that section; and the plaintiffs would therefore have their costs as between solicitor and client.

After a short discussion as to the form of the inquiry as to damages,

Mr. MOULTON asked that costs might be allowed on the higher scale.

Justice BUCKLEY, however, declined.

Mr. BOUSFIELD asked that the usual undertaking should be given on the payment of costs, to repay them if there were a successful appeal.

Mr. MOULTON suggested there was no reason for making any special order on that matter.

Justice BUCKLEY said he could not imagine the defendants wanted any special protection in the shape of an undertaking. They had heard of the plaintiffs before.

Mr. BOUSFIELD said it was the usual course. He was only surprised that his friend should refuse it.

Regarding the above report, the Solicitors for the Sunlight Company (Messrs. Michael Abrahams, Sons, and Co.) inform us that they have already served notice of appeal from the decision of Mr. Justice Buckley.

Damages for Personal Injuries Sustained in a Gas Explosion.

Sitting at the Newport (Mon.) County Court last Thursday, His Honour Judge Owen heard a claim brought by Henry Gatehouse, of the Little Crown Inn, Maindee, against the Newport Gas Company for £47 2s. as damages for personal injuries which he sustained through an explosion of gas on Dec. 20 last. Mr. Parsons appeared for the plaintiff; and Mr. T. B. R. Wilson represented the Company. It appeared that on the evening of the day named, Mr. Gatehouse went into his cellar with a naked light; and there was an explosion of gas. He was blown over three barrels, and had his eyebrows and eyelashes burnt off. Plaintiff suffered from the effects of shock to the nervous system, and had not yet fully recovered. According to plaintiff's evidence, for several weeks before the explosion there was an escape of gas in the street in front of his house; and on Nov. 22 he complained of the leakage to the Company's officials. It appeared that in laying the service defendants' servants left a hole leading from the cellar to the street, through which it was stated the gas entered the cellar. On an examination being made after the explosion, it was found that there was an escape through the breakage of the pipe at its connection. Witnesses were called by the Company to prove that the service was properly laid, and that the damage to it was caused either by the frost or through the settling of the building, which was a new one. His Honour held that the Company were liable, and that their servants should have closed the hole which they made in the cellar. Judgment was given for plaintiff for £20 damages, and £2 2s. medical fees, with costs.

Fraudulent Interference with a Gas-Meter.

Last Tuesday, George Carter, a cycle repairer, of 25, Stanley Place, Preston, was sued before the Preston Justices for fraudulently interfering with a gas-meter, the property of the Preston Gas Company. The interference which was the cause of action consisted in the removal of the plug to the tap on the inlet-pipe of the meter, and the insertion of a wooden plug and an india-rubber tube, to which was attached a wooden tap. From this tap another india-rubber tube was carried to the defendant's fittings; and in this way a supply of gas was obtained which had not passed through the meter. One of the Company's inspectors visited the premises in Carter's absence, and saw the contrivance in position. He subsequently interviewed defendant on the matter, and called his attention to the fact that he was getting gas which had not been registered. Defendant professed ignorance; but, on examining the arrangement in the presence of the inspector, he said he could see that he was doing as had been stated. He admitted that he had put on the india-rubber tubing, and had made the plug. The Company's meter tester stated that the interference with the meter had caused an escape of gas, which might have resulted in a serious explosion. Defendant informed him that he did not know he was consuming gas without its being registered. On behalf of the defendant, it was urged that the making of the plug was a "perfectly innocent transaction;" and that if he had had any fraudulent intention it was unlikely that he would have left it for the Company's servants to see. Defendant was exceedingly sorry for what he had done, and threw himself on the mercy of the Court. The Bench imposed the maximum penalty of £5 and costs, or a month's imprisonment; the Chairman (Mr. W. H. Woods) remarking that the defendant had been guilty of a very serious fraud, and that he might consider himself very fortunate that the Company had treated him as leniently as they had done.

The Newcastle Water Company have entered into an agreement to supply the Ryton District Council with water at the rate of 7d. per 1000 gallons, with a minimum payment of £400 per annum.

MISCELLANEOUS NEWS.

SOUTH METROPOLITAN GAS COMPANY.

The Ordinary Half-Yearly General Meeting of the Company was held last Wednesday, at the Cannon Street Hotel, E.C.—Mr. GEORGE LIVESEY in the chair.

The SECRETARY (Mr. Frank Bush) having read the notice convening the meeting and the minutes of the previous meeting, the seal was affixed to the register of proprietors.

The CHAIRMAN: Ladies and Gentlemen—My duty is to move: "That the report and accounts now presented be received and adopted, and the report entered on the minutes." As I am afraid this will be rather a long meeting, I shall endeavour to curtail my remarks on the report as much as possible. In fact, the report is so full and so long in itself, that I think there is very little which it is necessary to add or to explain. Paragraphs 1 and 2 speak for themselves. With regard to paragraph 3, the only remark I have to make is that I do not think gas companies get sufficient credit for the regularity of the supply of gas. It is not an easy matter to supply a great city like London with gas, with the regularity with which it is supplied; but it is done with such great uniformity—there is never a failure of the gas supply—that I fancy the public are apt to think it is a very simple matter indeed. But I can assure you that those who have to do it—especially our officers—have a good many anxieties. They have had them this winter, at any rate. I can say that, had it not been for the energy and devotion of our officers, and the hearty co-operation of our workmen, we should not have come through the winter so well as we have done. Paragraph 4 relates to the policy of the Company. Our policy has been for a number of years now to pay something short of the dividend to which the shareholders were entitled. The reason for the adoption of this policy was in order to increase the reserve fund. In the bad times succeeding 1890 and 1891, when the price of coal went up very much—though to nothing like the price it has reached this winter—we were in hopes that we should be able to tide through without raising the price of gas. Consequently, we used up our large reserve of £250,000, until at last it was reduced to £37,000 at Midsummer, 1892. Then we were obliged to increase the price of gas; and seeing that the reserve fund was so small, we did not think the position of the Company was safe. We therefore suggested to the shareholders, and obtained their approval to, the adoption of measures for restoring it to something like a reasonable amount. The £37,000 to which it was reduced in 1892 has now risen to nearly £130,000, by contributions from the divisible profits, by the shareholders foregoing dividends to which they were entitled in order to strengthen the position of the Company. And now in this paragraph there is a little reference also to the dividend. It shows how contented our shareholders have been. In 1886, we reduced the price to 2s. 6d. per 1000 cubic feet, and increased the dividend to 13 per cent., as it was then on the old capital—equivalent to £5 4s. on the converted capital. We simply multiplied the capital by 2½, and divided the dividend by 2½. I was rather surprised, in looking through these figures, to find that since 1886 we have only increased the dividend 2s. 8d., or if you go on the 13 per cent. scale 6s. 8d. We increased it from 13 per cent. in 1886 to £13 6s. 8d. in 1899, or from £5 4s. (which is the correct way of putting it) to £5 6s. 8d. But even this does not represent the actual dividends received by the shareholders. Under the auction clauses, which were introduced in 1876, all our additional capital has had to be sold by auction or tender at the market price. That price lately has been £140 for £100 of stock. This is really the capital of the Company; and it is the amount on which we ought to estimate the dividend. It is only a nominal £5 6s. 8d. on £100; but the £5 6s. 8d. on the nominal £100 becomes only 3¾ per cent. on the actual £140 which the public have given for the stock. So that the dividend paid to the shareholders in the Company is at the ridiculously low figure of 3¾ per cent. I think it is too low. I must confess that the Stock Exchange has put the value of the stock too high. Gas stock ought to pay more than 3¾ per cent. However, we have no control over the Stock Exchange; they do what they like. We are now entitled to pay £5 14s., which would bring the actual dividend up to a trifle over 4 per cent.; but, for the reasons already stated, we have not recommended an increase of dividend, and now unfortunately we have two very potent reasons why we should not recommend it on this occasion. We say in our report: "Two possibilities in the early future may, however, considerably increase the cost of gas making; otherwise the Directors think the patience of the shareholders might have been rewarded by increasing the dividend to 5½ per cent." Those possibilities are first of all the increased cost of coal; and unfortunately I am afraid gas coal has risen more than any other description of coal—more than house or steam coal. And I suppose the reason is that gas coal is a coal specially adapted for manufacturing purposes. Gas coal is a good coking coal; and whenever the iron trade is very brisk, there is an enormous demand for coke—any coal which would otherwise be used for gas production is devoted to coke making for the manufacture of iron. Gas coal was bought some two or three years ago at 6s. 9d. a ton. In 1897, it was 6s. 6d. a ton f.o.b.; but last winter it actually went up to 18s. or 19s. a ton, and a large contract I believe was made with a Foreign Company or the Corporation of Copenhagen a month ago at 15s. a ton—a rise from 6s. 6d. to 15s. No other coal has risen in like proportion. Then we say: "The rocks ahead are the present very high price of coal, which may not come down to a reasonable figure before the new contracts are made." Now if coal has not come down to a reasonable figure before the new contracts are made, there is no help for it but to increase the price of gas. I think that is perfectly fair—it is part of the bargain. The consumers are partners with the shareholders; and when special circumstances like these arise, the burden ought to be spread over both partners. This is the real object and purpose of the sliding-scale. That is why it was proposed, because the whole burden at that time was thrown on the consumer, and it was thought the shareholders should bear a part of it. We now say it is not fair that the shareholders should bear all the burden, but that the consumers should bear a proportion. It is often said, however, that when coal goes up in price, coke also rises, and thus meets the extra cost. That is not so. If coal only goes up 1s. or 2s. per ton, the price of coke no doubt will nearly meet it; but when coal goes up from 5s. to 8s., the additional price to be derived from coke will not meet it at all, or will go a very little way indeed towards meeting it. For instance, I may compare two half years. In the half year to December, 1898, we received for coke 6s. per ton of coal used; in the half year to December, 1899, we received 6s. 10d. for coke per ton of coal used. There was an increase of 10d. in the receipts for coke, besides the little increase in the price of tar and ammonia; bringing up the total increase in products from 7s. 11d. to 9s.,—or about 13d. But coal went up 1s. 7d.; it cost us in to the works 12s. 7d. in 1899, and only 11s. in December, 1898. So that the extra receipts for residuals have not recouped the additional price of coal, even though the extra cost of coal was only 1s. 6d. a ton. The reserve fund, moreover, is too small to meet a serious rise in coal—the laborious accumulations of eight years might go in as many months. I think I have dwelt long enough on this point to show that the only way to meet the extra cost of coal will be, if the price remains at anything like the present figures, to ask the consumers to bear their share of the burden. The next paragraph deals with another important matter which may affect our dividend. I do not think it will; because I do not believe the Bill will pass. And here I have to speak of a very important body. I wish to speak respectfully of them; they are a very important and powerful body. I refer to the London County Council. They are a very zealous body, and very well intentioned; but unfortunately good intentions do not make up for want of knowledge, and they very often deal with matters with which they are very imperfectly acquainted. The Council are now promoting a Bill to alter a contract made by Parliament in 1876 between the Gas Companies and the public as to the quality of the gas supplied. Parliament has known for the last forty years—they were first told it, I believe, by Dr. Letheby in 1860—that gas loses a certain amount of luminosity by travelling through the mains. Dr. Letheby said it lost about two candles in travelling from the gas-works at Bow Common to the City, and it loses something more in travelling through the small mains. Parliament knows that. It was made known at the time, and it has been made known from time to time in Parliamentary Committees ever since, that gas loses in luminosity, sometimes more, sometimes less, and sometimes not at all, but generally loses something in travelling from the works to the consumer. With that knowledge, Parliament fixed the quality of gas that we were to supply at 16 candles, to be tested in a certain defined manner, in certain places, and be tested by sample taken in bulk from leading mains. The London County Council have now devised a peripatetic portable photometer which is to be taken out and about in a cab. Testing gas is by no means a certain operation; for very delicate apparatus is required, and very careful conditions have to be observed as to temperature. Various rooms are fitted up with special apparatus for this purpose; and the temperature must be kept at one uniform point. The Council now propose to take a portable photometer to any part of the district, and attach it to a lamp-post or to a fitting in some house or building where the gas may have been lying stagnant for some time; and they find that, instead of 16-candle gas, it is very often under 16—sometimes it is about 15, sometimes it is under 14—and now they say that Gas Companies ought to supply 16-candle gas everywhere, though Parliament had fixed it at 16 candles tested in a certain way. Here comes in their ignorance. If the gas is to be supplied of 16 candles tested anywhere, instead of making it 16½ candles or 17 as we do at the works, we should have to make 19-candle gas. And who would have to pay for it? The worst of all these local authorities is that, whenever a gas company goes to Parliament, they think they should squeeze something out of it; the stupid people do not see it is the consumer who has to pay for it all. The gas company gets its maximum dividend; and if any additional cost is to be put upon us in the manufacture of the gas, it necessarily must be transferred to the consumer. From time to time when gas companies have been in Parliament, pressure has been put upon them to increase the illuminating power beyond what could have been obtained from the available coal supply; and this necessitates enrichment. This enrichment means that the consumers have to pay a considerable sum more for the extra quality than it is worth to them. If we had to make nearly 19-candle gas to meet the requirements of this portable photometer, we should certainly have to increase the price at least 2d. per 1000 cubic feet; and you may be quite certain if we increased the price 2d. per 1000 cubic feet the consumers will have a circular sent to them giving the reasons in the plainest terms—the reasons being that the London County Council have forced us to increase the quality, an increase the consumers have not asked for, and which they do not want, but for which they will have to pay this Company alone £84,000 for an inappreciable improvement in quality which would be of no use to them whatever. While on this point, I may say it is in the hands of the consumer to make the quality of his gas what he likes. We sent to some of the consumers' houses and got their burners and tested them with gas the illuminating power of which was 16¼ candles, and one of the burners gave a quality of 14·4 candles. That was the highest. The next highest was 12·6, the next 10·9, the next 10·4, the next 10, the next 9·6, the next 8·6, and then 7·9. The consumers reduced the 16 candles to 8 in some cases; but, on the other hand, the consumer has it in his power to increase 16-candle gas to 100 candles by the use of the Welsbach incandescent mantles, or by the use of the Siemens burners or the "Wenham" to 30 candles. By the use of the original Welsbach, the light can be increased to 60 candles; and by the use of the improved Welsbach, the consumer can get from 16-candle gas a light equivalent to 100 candles. That shows the absurdity of this action of the London County Council. When they see what will be the effect of it, they will be rather surprised, and probably they may alter their views. Now, under these circumstances, the Directors do not feel that it would be right to propose an increase of dividend. If we were to propose an increase of dividend, and to pay it, the Stock Exchange would put up the value of the shares; and in three or four months' time, from one or other of the causes referred to, we might have to raise the price of gas 2d. or 4d. per 1000 cubic feet, and down would come the value of the stock. Having 4d. in hand, we can raise the price 4d. without diminishing the dividend. With such a strong case, we feel it would be unwise to increase the dividend; but we will keep the 4d. in hand to meet the contingency. In paragraph 8, there is a statement showing how the position of the Company has been strengthened within the last ten years; and although I need not detain

you upon that, there is a singular fact to which I may refer. I go back to 1886, and I find that since that year we have reduced the price of gas 5d. per 1000 cubic feet. It was reduced to 2s. 6d. in 1886, and it is now 2s. 1d. The whole of the saving has come out of the amount required to pay dividend. Whereas in 1886 we required 13·4d. per 1000 cubic feet to pay the dividend, in 1889 we required 8·4d., or a difference of 5d., which is the same as the difference in price. This shows that we have been increasing the business to this extent, and yet we have not been able to reduce the cost incurred in the manufacture of gas. Coal is dearer, labour is dearer, and the whole of the saving has come out of the amount required to pay the dividend. We have done this by raising our capital on the most economical terms, and by spending it most carefully. The next paragraph relates to the profit-sharing system. We have sent out with the report a statement which I prepared for another purpose, though I had this in view—a sort of historical statement of what has been done. We feel that a full statement is due to the shareholders because this has now come to be a large thing—over £20,000 a year being paid—so that the shareholders have a right to ask: Is it commercially advantageous? If not, the thing is a failure and ought to be stopped, because we are not a philanthropic body. I think you will see, as we have seen, that it has been advantageous to us as a Company. The next paragraph deals with the question of the superannuation fund, which was started in the year 1855 by my father, the late Mr. Thomas Livesey. The rules are now being revised; and though the Company have been morally bound to maintain the payments fixed by the rules, we have never definitely or formally inserted that obligation in the rules. The Directors now propose to insert in one of the rules that the Company guarantee the stability of the fund. The fund is on the mutual system; and it is on the principle so commonly adopted now with regard to the officers of all great bodies. The Corporation of London and many Companies have superannuation funds for the pension of their officers. The officers contribute a certain percentage on their salaries, and the Company contribute an equal amount. This is the principle on which we act. The workmen contribute 3d. a week, and we contribute 3d. a week. We say to our people: "If you will help yourselves, we will help you; but we will not help you unless you show a disposition to help yourselves." This brings me to another interesting episode, which is in connection with the war in South Africa. A good many Companies have dealt liberally in this matter; and the Commander-in-Chief, speaking recently at the Mansion House, referred to the liberality of great employers of labour in very complimentary terms. When we saw the different Companies were resolving to give the wives of reservists half pay during their absence, it struck us that this was not quite the right principle. We did nothing for a week or so; and then one of our foremen—William Harvey—made the suggestion to his fellow workmen that they should contribute half the cost of supporting the wives of reservists. My consent was asked to the holding of meetings at the different stations. The men held their meetings, and agreed unanimously to contribute 1d. per week per man, which would be sufficient to provide half the cost for these people; and they asked the Directors if the Company would contribute an equal amount. I was pleased in two ways—first, that the suggestion came from the men; and, in the second place, that they had asked us to help them. It shows a mutuality of interest and feeling which is very gratifying. Generally, employees hesitate to approach their employers on any subject. We were pleased that the men approached us, as it is in accord with the system of keeping the employer and employees in touch. The Directors and officers were not going to be behind; and as a result £52 per week was contributed. The workmen pay £18, the Company £18, and the officers pay their contribution. Last week £52 was contributed, while £51 was expended in making provision for the women and children. The provision is 10s. a week for each wife, and 2s. for each child under fifteen; and they also receive something from the Government. The whole thing is worked and managed by the men; and it is managed as well as anyone in the office could manage it. The next paragraph deals with the Bill which the Directors are promoting; but as I shall have to refer to this matter presently, I will not touch upon it now. Paragraph 12 relates to the recommendation of the dividend. I may explain why we go by thirds. The usual thing is to go by halves and quarters. It is a matter of convenience. It enables us to pay all our dividends by even pennies. If we went by quarters, it would not be so. We propose that the dividends shall go by steps of 3s. 4d.—from £5 3s. 4d. to £5 6s. 8d., and £5 10s., and so on. The next paragraph relates to the retirement of the Directors; and I may mention that we have had a retirement and election of a Director since our last meeting. Since November, 1898, we have had two Workmen Directors elected by their fellow shareholders among the workmen, who have sat on the Board ever since. One retired last November; and I am very glad to say that Mr. Austin, the retiring Director, was re-elected by a very large majority. We did not know how the workmen would act—whether they would re-elect the Director or want to make a change. But in this case they have very wisely determined to re-elect the Director who had served them and the Company so well during the previous twelve months. I have nothing more to add; but I shall be very glad to hear any remarks, or to answer any questions. In conclusion, I propose the resolution which I have already read.

Mr. JOHN MEWS seconded the resolution.

Mr. KENNARD said he understood the Chairman to state that the consumers had a remedy in their own hands for increasing the luminosity of gas—namely, by employing incandescent mantles; but he wished to point out that after the mantles had been in use for a short time, they became foul, thereby diminishing the light. He was very glad to hear that their employees were on such friendly terms as to approach the Company upon matters concerning them; and he wished that these friendly relations existed in other places.

The resolution was then put, and carried unanimously.

Mr. ROBERT MORTON proposed—"That a dividend at the rate of 5⅓ per cent. per annum be now declared, and that the warrants be transmitted to the registered addresses of the proprietors by post."

Mr. HENRY AUSTIN said that he had much pleasure in seconding the motion—first, because he had had a finger in the pie in making the dividend; secondly, because he had a finger in the pie in distributing it; and, thirdly (and this was not the least pleasure), because he had to receive some of it. These three things all tended, no doubt, to the strengthening of that relationship which should always exist between employers and employees, as it tended to consolidate the union which was so requisite for the carrying on of any business with success. When there was friction, there was always extra cost. The principle of mutual contribution towards the maintenance of the wives of reservists was the very line of action that carried them throughout the distribution of the social order of the South Metropolitan Gas Company. Another thing of which he felt proud was the compensation for accidents. Instead of workmen being so foolish as to instigate litigation, they now mutually contributed week by week so much in order to meet any accident that might occur at the works; and cases which would not be recognized by law were now entertained. This had an educational effect upon their feelings. With regard to the action of the County Council, he might say that housewives did not want a luminous gas to cook by or to heat an incandescent mantle. The step proposed by the County Council was a retrograde one. If they could be as practicable as they were idealists, everyone would have more confidence in them. He was authorized by his fellow-workmen and shareholders to express their thanks and gratitude to the shareholders for having sanctioned so humane a principle as the profit sharing system.

The resolution was carried unanimously.

Mr. EWART proposed the re-election of Mr. Livesey and Mr. Morton as Directors.

Mr. HOWLETT seconded the motion, which was carried unanimously.

Mr. Charles Mortimer was afterwards unanimously re-elected an Auditor of the Company.

An Extraordinary General meeting was then held, to obtain the shareholders' approval of the Company's Bill.

The SECRETARY having read notice convening the meeting,

The SOLICITOR read the heads of the Bill.

The CHAIRMAN: I now move—"That the Bill now submitted to this meeting, intituled 'A Bill to empower the South Metropolitan Gas Company to alter the provisions as to the standard price and illuminating power of the gas supplied by the Company, to construct a railway in the Parish of Greenwich, and to purchase by agreement so much of the southern portion of the undertaking of the Gaslight and Coke Company as is situate in the County of London south of the Thames, and for other purposes,' be, and the same is hereby, approved, subject to any amendments which shall be made thereon by Parliament and approved by the Directors." In making the motion, the Directors feel that it is due to you that definite explanation should be given as to the purposes of the Bill. I may deal with half of it very shortly. Sixteen out of the thirty-two clauses relate to the railway, which is only about three-quarters of a mile long. It is a very small and unimportant matter. We have done without it a good many years; and we could still do without it. However, it gives us a railway connection; and we propose to take parliamentary powers to construct it. These sixteen clauses are the regular stock clauses which are inserted in all Railway Bills. The other parts of the Bill are of vastly greater importance. In the paper sent out with the report, it is stated that: "The main object in promoting this Bill is to carry out the recommendation of the Select Committee on the Metropolitan Gas Companies of last session." You will probably remember that last session a Committee was appointed to enquire into the question of the charges made by the Metropolitan Gas Companies. That Committee investigated the matter very thoroughly, and made certain recommendations, one of the most important being that the initial price of the three London Companies—the Commercial, the Gaslight and Coke, and our own—should be reduced to 3s. 3d. Our initial price was 3s. 6d.; and for every penny reduced below that, we were allowed to pay an extra ¼ per cent. on the nominal capital. This initial price, when once fixed, is a parliamentary bargain which ought not to be altered. However, last session it was altered in the case of a Suburban Gas Company, where the House of Lords reduced the initial price 6d Following that, the Committee to which I have referred reported that it was advisable that the initial price of the London Gas Companies should be reduced to 3s. 3d., the Commercial and the Gaslight and Coke Company's being 3s. 9d.; but they added a provision which would give us at the lower end of the scale what they proposed to take off at the upper end. For instance, by reducing the initial price to 3s. 3d., for all prices above 2s. 6d. at which we might sell gas we should have a smaller dividend under their proposal than we are now entitled to; but when we got to 2s. 6d., the dividend under their system would be the same as under our Act, and below 2s. 6d. there was a slight advantage, and we were to get a little extra dividend when we were below 2s. 6d. under their new proposal than we are now entitled to. Taking our converted capital as the basis, we are entitled at the present time to an increase in dividend of 2s. per cent. for every 1d. reduction in the price of gas. They proposed that, in addition to the 2s. for each 1d., there should be an extra 2s. for every 3d., which amounts to an average of 2s. 8d. for each 1d., giving us one-third more for the 1d. than we are now entitled to. This extra third, when gas is below 2s. 6d., makes the dividend rather higher than it would have been. That would not have been a sufficient inducement to us to accept the proposal; but we thought the time had come when something of the sort was necessary. The Directors gave a very great amount of consideration to it. I do not know that I ever knew them give so much consideration to any subject as to the report of the Committee; and at last they decided it would be desirable to accept the proposal of the Committee as to the reduction of the initial price, and their chief reason was this: The fact that an initial price had been reduced 6d. by a Committee of the House of Lords—the fact that the Committee had recommended that the initial price of the London Gas Companies should be reduced—made us feel that it would be used against any gas company going to Parliament for additional powers in the future. Instead of being able to maintain the inviolability of their initial price, they would be attacked in this way; and it is extremely probable that Committees will reduce the initial price of companies going to Parliament. Under these circumstances, we thought it better to take the proposals of the Committee at once, rather than wait until something, probably very different, had been carried in Parliament, and then when our turn came we might find ourselves very much worse off than we should be if we had accepted the proposal of the Committee. As a matter of fact, we shall not be any worse off at all. I do not think there

is a probability of our price going above 2s. 6d.; and, so long as it does not, we shall be better off under the new proposal than under the old. That is the reason why the Directors thought that it would be wise to take the proposal of the Committee and embody it in a Bill. We have not exactly adopted the proposal. The Committee suggested another proposal—2s. for each 1d. and a further 2s. for each 3d. We thought that a little complicated, and we made the two into one, and have put 2s. 8d for each 1d. If any shareholder has any question to ask about this, I hope it will be asked, as the alteration of the initial price is a very serious matter. The principal witness for the London County Council, Mr. Haward, who gave his evidence very fairly, made the singular remark that the sliding-scale had become almost practically inoperative. The amount of increase of dividend accruing to the shareholders under the sliding-scale is not sufficient to induce them to make reductions in price. Whereas when the sliding-scale was first introduced the shareholders got one-fourth of the saving—supposing £8000 were saved, the shareholders would get £2000, and the consumers £6000—now the shareholders only obtained half that, they only got one-eight. If we can make a saving of £8000, the shareholders would get £1000, and the consumers £7000. In fact it comes to this, we must give the consumers £42,000 a year to get an increase of dividend of 1s. 5d. per cent. on the actual value of the stock. Practically, we should have to reduce the price 3d. per 1000 cubic feet before there would be anything worth dividing among the shareholders. Mr. Haward was perfectly right in declaring that the sliding-scale was becoming inoperative. The Committee have gone a step in the right direction; but whether they have gone far enough is a question. Another recommendation of the Committee was that the district of the Gaslight and Coke Company south of the Thames should be transferred, on equitable terms, to the South Metropolitan Gas Company. The Gaslight and Coke Company in 1882 amalgamated with the London Gas Company, of which Mr. Morton was Engineer for a number of years. The late Secretary of the Gaslight and Coke Company was a man of large ideas. One great idea of his was to have one enormous Gas Company for London; and he thought in amalgamating with the London Company, who supplied gas on both sides of the river, it would be a great strategic movement towards the attainment of his object—absorbing the whole of London into the Gaslight and Coke Company. It failed. In considering the proposal, the Board of Trade made a very important and onerous condition. The condition was that the Gaslight and Coke Company should never charge a higher price for their gas on the south side of the Thames than the charge for the time being of the South Metropolitan Company; and at present the difference between the two is 10d. per 1000 cubic feet. From Mr. Phillips's point of view, I can understand it was a reasonable and proper step to take; but the strategy failed, as other strategical movements have done, and it has landed that Company in having to supply one-tenth of their gas at 10d. per 1000 cubic feet less than the price they charge for it upon the other side of the river—including the public lights. When they are selling gas at 10d. per 1000 cubic feet less to one-tenth of the consumers, it means that they are charging the other nine-tenths 1d. per 1000 feet more than they should pay. The Committee said that it is not fair to consumers on the north side that they should pay a penny more, in order that consumers on the south side should pay less; and they recommended that a transfer should take place. We opened negotiations last August; and so far as we are concerned, we may say they are closed. We had a very friendly meeting, and we agreed on everything, as Colonel Makins said the other day, but the price. They wanted more than we thought it was worth. We made a calculation of what it would be worth to us. It would not be proper to give figures; but I may state the principle. We took their own figures of the cost of making gas, and we took our selling price; and we said: "Between your cost of making gas at Nine Elms and our selling price, there is so much per 1000 cubic feet difference; that amounts, on the gas sold on the south side of the river, to so much money." We calculated what capital this money would pay interest on at 3½ per cent.—we took the very lowest rate at which we could raise capital—and we said: "The revenue we should derive, based on your own figures with the sale of gas in the south of London, will enable us to pay interest on so much capital at 3½ per cent." We offered this amount of capital for the southern district and its proportion of the works. The works at Nine Elms are capable of doing more than double what is necessary to supply the southern district. We said: "We are constructing new works at East Greenwich. We will give you the same price for the surplus old works as we can construct new ones for." We thought we were dealing very liberally with them; but they said: "Oh, no; these old works cost us more, and you must pay us what they cost." We replied: "We cannot do that." We did not take into consideration their other disadvantages. We made an estimate of the value, as far as we were able to do to see what we could afford to give for the property. If we had taken into consideration the great disadvantages under which they labour—through having to sell gas at so much lower price, and the necessity for additional capital—we might very well have said that these disadvantages are worth so many hundred thousand pounds to you, and you ought to take that off the price we propose to give. But we did not attempt to take advantage of the drawbacks; and we offered the highest price we felt justified in doing. We declared at the outset, before any negotiations were opened, at our meeting in August last, that we would have no arbitration. Colonel Makins, at the meeting of the Gaslight and Coke Company, said: "We are quite ready to submit the matter to arbitration; but the South Metropolitan are not. Therefore they feel their case is a weak one." We know perfectly well—better than any arbitrator—what the concern is worth to us; and we will trust no arbitrator whatever. He would be misled probably by the evidence, and by the specious talk of the lawyers. We can do just as well without the southern district of the Gaslight and Coke Company as with it. We are quite big enough. We have gained nothing in economy since 1886, and our business has about doubled. Last winter we used 1,050,000 tons of coal; and we do not want to add to our burdens. But we are quite ready to accept the suggestion of the Committee to relieve the Gaslight and Coke Company of a great incubus, and take it upon ourselves to simplify the gas supply. There is another matter in the Bill to which I may refer—namely, the proposal to reduce the illuminating power. I touched upon that in my previous speech; but I may just say it comes to this: The most economical and the best illuminating power for the consumer is that which can be obtained from the available supply of coal. It has been forced up to something more than we can get out of the coal; and as a consequence various enriching materials have been adopted. The best enricher is cannel coal; but we cannot use this, as it has become so scarce and dear that it is out of the question. Another enricher is petroleum spirit, which is not altogether satisfactory, as it does not carry to the full extent of the district. A further means is by carburetted water gas, which is objectionable upon other grounds. The best gas with which consumers can be supplied is coal gas. We cannot make a 16-candle gas, but we could probably make 15-candle gas; and we therefore propose that we should supply unenriched gas—unadulterated gas, for enrichment after all is only adulteration—at a reduction of price. If the quality is reduced 1 candle, the initial price would be reduced 1d. under the Bill; and if the initial price is reduced 1d., we should have to lower the selling price by 1d. in order to get the same dividend. A good many people have considered that this is rather a novel idea; but it is gaining ground. I may tell you that at least 50 per cent. of our gas is consumed for purposes other than lighting—namely, for cooking, heating, manufacturing, and power—and a large proportion of that employed for lighting is used with Welsbach burners; and I may say it is for the advantage of gas consumers to change their mantles when they deteriorate, as by so doing money will be saved. A friend of mine recently told me that he obtained as much light from three Welsbach burners as he formerly did from eight ordinary gas-burners; so that the saving in his case was considerable. Using 12 cubic feet of gas per hour did the work of 40 cubic feet. I have no doubt that mantles will become cheaper. In Germany, they are supplied at 3d. each; and in Central Germany, 85 per cent. of the lighting is done by means of the incandescent system. If that is coming—and I believe it is—a cheap heating gas is what is wanted, because a cheap heating gas would be far more advantageous to the public than an expensive high-candle gas such as we are now forced to supply. This will be all dealt with; but it is a proposal in the Bill of which you ought to be informed. Another part of the Bill relates to the adoption of regulations for the supply of gas by means of slot meters. This was a recommendation of the Committee also. They thought that the poor consumers ought to be protected against expensive charges. We find this is necessary. We supply gas at a certain rate. We profess to supply the slot consumers at the same rate as the others; and it would not be fair to supply them at less, or to charge them more. Such consumers are charged 9d. more; but that goes to pay the rent of meter and cooking-stove, repairs and maintenance, and cost of collection. We find that, by charging this extra 9d., he is paying the same sum as the ordinary consumer. It is considered necessary that the charge should be regulated by Parliament; and we have put in a clause that the maximum charge should be 9d. There is just one other matter with regard to the capital account. Since we converted our capital, there has been a little difficulty, with the result that no one can tell from this account what is the amount of capital on which we pay dividend. In statement No. 1 you will see the amount, including premium, is £6,072,971; but the amount on which we pay dividend is £5,641,885. No one can tell it, except by intricate calculation. In the case of debenture stock, it is worse. The debenture stock stands at £1,795,160; and we are paying interest on £1,520,000. In the capital account, No. 3, we state the exact amount of money which we have received—so much for ordinary stock, so much premium; so much for debenture stock, and so much for premuim—making a total of £4,016,464. We think we should make it clear what is the exact amount of capital on which dividend and interest are paid; and therefore we put a clause in our Bill to carry this out. There is the Bill; but we are in this happy position, that we do not care a rush whether it passes or not. We are honestly trying to carry out the recommendation of the Committee; but if an attempt is made to impose onerous conditions, we are in a position to drop the Bill. We are endeavouring to carry out a suggestion which we believe will be for the advantage of the consumers, and we will try our best to carry it out. But we are in the happy condition that we can go on for seven or eight years without approaching Parliament; and if difficulties are put in the way, or onerous conditions are attempted to be placed upon us, we shall say: "Very well, gentlemen, the Bill is withdrawn." I now beg to move the resolution.

Mr. MORTON seconded the motion, which was put and carried unanimously.

On the motion of Mr. STOCK, a hearty vote of thanks was accorded to the Chairman, Directors, officers, and staff.

The CHAIRMAN, on behalf of his colleagues and himself, briefly acknowledged the compliment.

Mr. C. C. CARPENTER and the SECRETARY also briefly returned thanks; and the proceedings then terminated.

CRYSTAL PALACE DISTRICT GAS COMPANY.

The Half-Yearly General Meeting of this Company was held last Friday, at the Albion Tavern, Aldersgate Street, E.C.—Mr. GEORGE LIVESEY in the chair.

The SECRETARY (Mr. Charles M. Ohren) read the notice calling the meeting; and the report and accounts, which were summarized in the JOURNAL last week, were taken as read.

The CHAIRMAN said it was his duty to move the adoption of the Directors' report and the accounts. Before dealing with them, however, he should like to say that there was a very satisfactory piece of news for employers and workmen who were anxious for freedom, in the fact that it was now settled by the Courts that picketing was illegal, except for purposes only of giving or receiving information. All besetting, or watching, or bringing pressure to bear upon men was declared illegal. It had gone through the Courts; and the Trade Unionists were going to take it to the House of Lords. But they had given up their purpose of appealing; so that any picket now, if he violated the law, was subject to a fine of £20, or three months' imprisonment. This was indeed good news for employers and workmen. He thought the report which the Directors presented was of a satisfactory character. At one time, the Directors had a stereotyped form of saying: "The Directors have the pleasure of presenting a satisfactory report." They had dropped this now, simply because they thought it became so usual that it might be considered a mere matter of form. But he could

assure the proprietors that the report he had to present that day was really of a satisfactory character. They had got down again to the lowest price at which they ever sold gas. Some years ago, they charged 2s. 6d. per 1000 cubic feet; but the price had to be increased in consequence of the extra cost of coal, labour, and other things. Now they had returned to the price of 2s. 6d., which for a Suburban Company was, he thought, a very low figure. There was, however, one Suburban Gas Company which beat them hollow. It used to be called the "little" Wandsworth and Putney Company. But it was not so "little" now, and they sold gas at 2s. 1d. per 1000 cubic feet. Mr. Shoubridge would see what he could do to overtake them; but he (the Chairman) thought he would find it hard work to do it. The reduction of a penny, as stated in the report, was equivalent to £2350 advantage to the consumers in the half year; but, notwithstanding, they had a balance on revenue account of £18,909. Seeing that the interest on the debenture stock and the dividend on the capital stocks only amounted to £18,068, they had a surplus of nearly £900, from which had to be taken £243 as interest on a temporary loan. Still it left a surplus of some £600 on the half-year's working, notwithstanding the reduction in price. This was no doubt partly due to the satisfactory increase of 9 per cent in their business, which was something like going back to the old times. Many years ago, gas companies used to reckon upon an increase of 10 per cent. per annum. Then they dropped to 3 or 4 per cent.; but now they were getting up again to the old figures. He thought this was largely due to the great increase in the use of gas for cooking and heating purposes, and to its employment by the working classes or weekly tenants by means of slot meters. Until this invention was brought out, the working people of London did not use gas, because they could not pay a quarter's gas bill, and they were not willing to bear the expense of fitting up their houses. Now the gas companies did this for them. They supplied the meter, cooking stove, and fittings, and kept them in repair, adding a certain charge for them to the price of the gas. They were selling gas to the ordinary consumer at 2s. 6d. per 1000 cubic feet; and to the slot-meter consumer at 3s. 3d., which was an extra 9d. The 9d. paid for the meter, stove, and fittings rent, maintenance, and the little additional cost of collecting. This, he thought, accounted to a considerable extent for the increase in business. Another reason was that the weather was rather cold in December; and this helped to increase the consumption of gas. But while these things were all very pleasant for the shareholders, there was another side to the question. These increases, in times like the present, entailed a great deal of anxiety on the management. For instance, there had been great difficulty—this Company had experienced it in common with all other gas companies—in getting their supplies of coal, because the demand for manufacturing purposes had increased so largely, and gas coal was more in request for manufacturing purposes than house coal or steam coal. Consequently, the run upon gas coal had been something exceptional; and all their contractors had found some difficulty in supplying the monthly stipulated quantities. This had been one cause of the anxiety and difficulty which had fallen on the shoulders of the responsible management of the Company. However, they had got through it; and he thought the Directors and proprietors might congratulate themselves on having men who, when there were difficulties, did not hesitate to cope with them in the right spirit. They had brought the Company through very satisfactorily; and the consumers had had a better supply of gas this winter than they had ever had before. What a consumer wanted was an abundant supply, particularly in cold weather, because he said, and very rightly too, "You recommend me to use gas-fires, and you let them out on hire; but when I want gas most, in the coldest weather, you reduce your pressure." This could not be said of the Crystal Palace Gas Company, because this winter, as he had remarked, they had had a better supply than ever. The next paragraph in the report related to the dividend. The Directors recommended the payment of a dividend at the rate of 5¼ per cent. on the ordinary stock. Now for every reduction of 1d. per 1000 cubic feet, they were entitled to pay an extra dividend of ⅛ per cent. Previously, they had a penny in hand, and were entitled in June last to pay 5⅜, or £5 7s. 6d. per cent. The extra penny reduction in the December half year gave the proprietors the right to another ⅛ per cent.; so that now they were entitled to 5½ per cent. But the policy of the Directors had been not to divide an odd ⅛ per cent.; but when they had a right to even money, they recommended its payment. Some of the proprietors might say, "Then why do not the Directors recommend a dividend 5⅜ of per cent. on this occasion?" He thought there was a sufficient reason. They did not know what would be the condition of the coal market when they had again to make their contracts. The contracts were made yearly, to run from the 1st of April to the 31st of March; and they would have to see about the new ones next month certain. If anyone could tell the Board that the price of coal in March would be the same as it was last March, then he (the Chairman) would say it was a great pity they did not recommend the payment of the 5½ per cent. But no one could tell them that. The probability was the price of coal would be a great deal dearer than it was last March; and it might happen it would be so much dearer that they would not nearly be able to make both ends meet at the present price of gas. Therefore, the possibility that coal might be considerably dearer entailed the possibility that the Board might be compelled to raise the price of gas, which would necessitate a reduction of the dividend if they were paying the full amount. They thought it better to let the dividend stand at the same figure; so that, under present circumstances, they could increase the price of gas to 2s. 8d. per 1000 cubic feet without suffering any loss of dividend at all. It might be said, "The Company have a large reserve fund." Granted. In their case, he admitted, the reserve was large. For instance, comparing it with another Company—its neighbour—the reserve fund of the Crystal Palace Company was equal to 8d. per 1000 cubic feet of gas on the year's consumption, while the South Metropolitan Company's reserve was not more than 3d. per 1000 feet on the year's consumption. Therefore the Crystal Palace reserve was nearly three times as large in proportion as the South Metropolitan. If the rise in the price of coal should be only slight, the Board would feel it right to take a moderate amount from the reserve; but if the rise was great, then they felt it would be only fair and proper to put part of the burden on to the consumers. That was really the bargain of partnership between them. When the cost of making gas was reduced, both shareholders and consumers derived advantage; the latter to a greater extent than the former. A penny reduction gave to the consumers about £4600 a year; and it entitled the shareholders to about £700 of additional dividend. These were the proportions. The consumers got the lion's share of the benefit; and, this being so, he certainly ought to bear his proportion of the extra expense entailed upon the Company by the higher cost of coal. The Directors would, if necessary, be prepared to take some of it out of the reserve fund; but not all. The next paragraph of the report related to the loss the Company had sustained; but he believed he mentioned this at the last meeting. They all very greatly regretted the loss of Mr. Layton; but fortunately they had found a successor in Mr. Robert Morton—a man of life-long experience in gas matters. In regard to the accounts, it was commonly said that when coal went up in price, coke followed. So it did. But he would like to call attention to the figures for two half years. He found that in the corresponding half of 1898, they received for coke 6s. 6¼d. per ton of coal used; while last half year they obtained 7s. 1⅞d., which was a difference of 7⅝d. But the price of coal went up from 13s. 4d. in the December half of 1898 to 14s. 7½d. in the December half of 1899—a rise of 15d. in coal, as against the extra 7d. obtained for coke. He thought this showed that, while coke brought them back something, if the price of coal rose extensively, coke did practically little or nothing. There was one feature in the accounts which was rather a novelty. They had introduced an oil-gas plant, or what was technically known as a carburetted water-gas plant. This had helped them very materially, because they were able to buy oil (it was true at a high price) when they were short of, or in difficulties about, coal in December. But the point he wished to call attention to was this: There were many English companies using this oil-gas plant; but the cost of making the oil gas was not stated in the accounts separately or distinctly. He confessed he had never been able to make out what it did cost. It was not, however, fair to take their short experience. They were only working the plant about three weeks last half year, and during that time they made 8,824,000 cubic feet of gas. But they had entered the cost in the accounts separately. In the revenue account under the expenditure for coal, they stated that they spent for oil £672, for coke for the oil gas £253, and for labour £30—a total of £956. Then the purification of the oil gas cost £63; and under "wages" £30 was charged. These items worked out to 2s. 4½d. per 1000 cubic feet; but it was hardly fair to take this figure, because he believed Mr. Shoubridge would tell them they would eventually be able to manufacture cheaper than this.

Mr. SHOUBRIDGE: It is not fair to take that figure, because there was the heating up, and getting the whole thing to work.

The CHAIRMAN (continuing) said the cost would not come down to that of coal gas, the cost of which, taking the similar items, was only 10¾d. Then there was something extra on the coal-gas plant for interest; it was more expensive, and required a little more for repairs. But he did not think the coal gas would come to more than 1s. 1d. per 1000 cubic feet for manufacture and purification; while the oil gas had cost them 2s. 4½d. But it must not be assumed that this would be the cost in future. It ought to be stated, however, that the price of the oil used was 4d. per gallon; and the quality of the gas was from 17 to 18 candles. He would promise that the gas fraternity should know exactly what the oil gas did cost. They certainly did not expect the oil gas would be so expensive; but the plant would be of use for one of the purposes claimed for it—and a very important purpose too. The manufacture of oil gas could be started at very short notice. In three hours the apparatus could be got into full work; whereas in coal gas manufacture it was about three days before the retorts could be in full operation. In any sudden emergency—heavy, cold, or foggy weather—a greatly increased supply of gas could be obtained at three hours' notice. He thought this would be the main purpose to which their oil-gas plant would be devoted. If they did not use it constantly, they would always have it ready for emergency; and for that purpose it would be very valuable. He concluded by formally moving the adoption of the report and accounts.

The DEPUTY-CHAIRMAN (Mr. Frederic Lane Linging) seconded the motion, which was unanimously carried.

On the proposition of the CHAIRMAN, seconded by Dr. FREDERIC HETLEY, a dividend of 5 per cent. per annum on the preference stock and of 5¼ per cent. on the ordinary stock, less income-tax, was declared.

The CHAIRMAN next moved the re-election of Mr. James Glaisher as a Director. Mentioning that, owing to the inclement weather, Mr. Glaisher had wisely abstained from attending the meeting, the Chairman stated that on April 7 next their esteemed colleague would complete his ninety-first year. His intellect was as good as ever; and he was a painstaking, conscientious, and capable Director.

Dr. HETLEY seconded the motion, which was cordially passed.

The DEPUTY-CHAIRMAN moved the re-election of Mr. Robert Morton to the Board, remarking that the proprietors might congratulate themselves upon having secured his assistance in the direction of their affairs.

The CHAIRMAN seconded the motion, which was unanimously agreed to.

Mr. MORTON thanked the proprietors for confirming his appointment by the Directors; and he hoped by-and bye to justify their confidence.

On the proposition of Mr. H. E. JONES, seconded by Mr. F. E. LINGING, Mr. A. G. Hounsham was re-appointed as an Auditor.

The CHAIRMAN remarked that Mr. Alfred Lass, who was a man of great experience in gas matters—perhaps none more so in gas accounts—owing to the general decline of his health, had resigned his position as Auditor. For the vacancy, there was only one candidate.

Mr. F. E. LINGING moved that Mr. Thomas Guyatt be elected an Auditor in the place of Mr. Alfred Lass. Mr. Guyatt, he observed, was a gentleman who had been connected with gas and gas undertakings all his life—mostly in the secretarial department. He had been Secretary of the Ceara Gas Company for something like 30 years. He (the speaker) understood he had just retired from that position; and, as a recognition of, and reward for, his long and valuable services, the Directors had very wisely offered him a seat on the Board. He was also Secretary of the Ottoman Gas Company, and held many other appointments in connection with gas. With such a record as this, he (Mr. Linging) felt it would be fulsome on his part to reiterate or dilate upon the fitness of Mr. Guyatt for the vacant position.

Mr. E. K. BLYTH seconded the nomination; and the CHAIRMAN endorsed the remarks made by the proposer.

The motion having being carried, Mr. GUYATT suitably acknowledged it.

Mr. H. E. Jones said the proprietors would not like to disband without recording their obligations to the Chairman and Directors for their services. If they wanted a testimonial, it would be found in the Stock Exchange list, which placed their stock at about the highest price but one of any stock in the gas market.

Mr. C. Beadle seconded the motion, which was heartily agreed to.

The Chairman replied; and then moved a vote of thanks to the officers and staff. He referred to the devotion to the Company of Mr. Shoubridge and Mr. Ohren, and to the loyalty of the men. As evidence of this, he mentioned that the carbonizing wages were still going down. Last half year, they amounted to 2s. 8½d. per ton of coal, whereas a year ago they were 3s. 1d. They had been continuously falling under the joint co-operation of Mr. Shoubridge and those under him. One other little fact he should like to refer to. It was that a number of the men had been called out as reservists; and their fellow-workmen, quite on their own initiative, started a fund for the wives and families. As soon as the Directors were informed of this, they gladly co-operated with the men; and, between them, the wives and children of those who were away on active service were being provided for.

Mr. Shoubridge and Mr. Ohren briefly acknowledged the vote; and the proceedings terminated.

CROYDON COMMERCIAL GAS AND COKE COMPANY.

The Ordinary Half-Yearly General Meeting of this Company was held last Friday, at the Offices, Katharine Street, Croydon—Mr. Charles Hussey, J.P., in the chair.

The Secretary (Mr. W. J. Russell) having read the notice convening the meeting, the report and accounts, which were summarized last week, were presented.

The Chairman said he had the greatest possible pleasure in proposing that the report of the Directors and the statement of accounts be received and adopted. The first thing, naturally, to which the Directors referred on these occasions was the sale of gas; and they were very glad to be able to present to the shareholders a satisfactory increase. The quantity of gas sold showed an increase of 30,370,100 cubic feet over that of the corresponding period of 1898—equal to 9·56 per cent., or in money value to £4332. He thought this was very satisfactory, when they remembered that they had to struggle against the electric light, which was being very strongly pushed by the Corporation. But he felt sure that as they went on, and gas became more used for cooking and heating purposes, they would be able to show still more satisfactory results. He had seen the balance-sheets of several different companies; but in few was he able to find anything like the increase shown here, and only one that was larger. This, he thought, spoke well for the low price of gas in Croydon, compared with that of other companies, and also for the way in which their customers were treated. They had supplied 400 additional ordinary, 842 prepayment, and 101 automatic meters; and 888 more gas cooking and heating stoves had been let out on hire. This showed that they had still a large increase going on in this branch, and that they were able to hold their own notwithstanding the electric light competition. He thought a great many of those who used the electric light were dissatisfied with it, as they had seen lately that a deputation had waited upon the Chairman of the Electric Light Committee of the Corporation, and they did not come away altogether pleased. The receipts from residuals were naturally higher, coal having gone up in price; but there was not the increase that should be shown. He did not think people realized the difference in price between coal and coke, and that they would find coke broken up was a good thing to cook with. He assured them that they would find broken coke a great saving. They had been able to make contracts for many things up to the end of June next; and therefore during this half year they did not find the difference which they were afraid they would have to meet when their present contracts ran out. But "sufficient unto the day is the evil thereof," and he would not anticipate, for prices might go down again before that time arrived. They had necessarily made several alterations to cope with the increased business. They had partially duplicated their new water-gas plant, and had to put down a new purifier. They also intended to lay an additional trunk main from the works to Purley, for the purpose of giving an increased supply to South Croydon, Purley, Kenley, and Coulsdon, including Cane Hill Asylum. They all knew that South Croydon was growing very much; and in the past few years they had practically doubled their supply down the Brighton Road. Still this was not sufficient; and they had no alternative but to lay down a new main. They had spent during the half year £6620 18s. 7d. on capital account; and he thought, considering the work carried out, they had been very economical. It included new buildings, water-gas plant, purifiers, mains in 22 roads, and gas-stoves and house-fittings—making the total expenditure on capital account up to Dec. 31 last £383,270 19s. 8d. Coming to the receipts, he said from private consumers in the Croydon district they received £36,978, being an increase of £3028; from the Carshalton district, £4671, or an increase of £611; and from public lighting and under contracts, £6629, or an increase of £594. This was in spite of the Corporation lighting additional roads with electricity, and removing many lamps. For the rental of gas-stoves they received £1428, or an increase of £213; and for the rental of house-fittings, £611, or an increase of £97. Thus a total increase was shown of £4686 10s. 4d. on the half year. Turning to the sale of residuals, he said for coke they had received £10,980, or an increase of £1791; and the net average price realized was 1·01d. per cwt. increase. Breeze, however, was £92 less than in the corresponding half year—being £599; tar realized £1507, or an increase of £402; and sulphate of ammonia, £1651, or £143 more—there being an increase of 18s. 4d. per ton over the net price in 1898. Some might say that they ought to have made more; but the more oil gas they made, the less sulphate of ammonia was produced. This gave a total increase of £2244 17s. 6d., which he thought must be considered very satisfactory. Thus they had received from all sources £66,370 6s. 2d.; the total increase being £6932 15s. 10d. Now he came to one of the most important items of expenditure in the manufacture of gas—coal, oil, &c., £23,841 12s. 7d., being an increase of £4557 14s. 11d. over the corresponding half year. They had carbonized 2707 tons more coal, and used 57,080 gallons more oil. Of course, this extra expenditure was mainly owing to the increased price of 1s. 6d. per ton for coal. He was afraid that when their contract came to an end, judging from the present view of things, they would have to pay a much higher price than this; but, on the other hand, between now and then the prices might come down. He hoped it would be so, both for the sake of those burning coal in the house and of those using it in gas-works, because it was not an agreeable thing to have to go back to a higher price for gas. He did not mean to say that they would have to adopt this course; but he might give them a few figures to show what the result of increased prices would be. Supposing they had to pay 1s. per ton more for coal, in using the same quantity as now it would cost them £1226 more than they were at present paying. But he would say 4s. would more likely be the figure they would have to pay, which would mean an increase of £5065 in the half year. Supposing they had to raise the price of gas 1d.—making it 2s. 9d. per 1000 cubic feet, instead of 2s. 8d.—they would thus get £1449 8s. 5d., or about equal to 1s. per ton on the price of coal. If, however, they increased the price by 4d., they would get £5797. The Chairman then proceeded to say that the purification of gas cost £1332, or £349 more, partly on account of the increase of oil gas; wages and gratuities, £4266, were £491 more; repair of works, &c., £5034, or £374 less; and repairs to mains, £2603, or £513 more. There were various other small items of increase, bringing up the total additional expenditure to £48,792 7s. 6d.—thus leaving a balance to be carried forward to net revenue account of £17,717 18s. 8d. He thought this must be considered very satisfactory. It would be seen that they had spent a good deal on capital account; and they were contemplating the spending of a good deal more. They would see that the Directors had decided to offer £5000 consolidated "B" ordinary stock and £2500 5 per cent. perpetual debenture stock for sale by auction, in March next; and a call of £2 per share would be made on the 2500 Carshalton capital shares of £10 each (£6 paid). He felt sure the Carshalton shareholders would appreciate the fulfilment of the promise held out to them for a long time. After providing for all fixed charges, and paying the usual dividends, there would be a balance of £3396 to carry forward to the next account; and he thought, with a reserve fund of £32,326 and an insurance fund of £15,584, they could prove to investors that the Croydon Gas Company offered one of the best investments they could have.

Mr. Lambert seconded the motion, which was carried unanimously.

Mr. Corbet Woodall then moved that the usual dividends of 14, 11, and 9 per cent. on the various classes of stock and shares should be paid. He remarked that the balance-sheet showed they had earned sufficient in the half year to pay the usual dividends and carry forward a good sum. He expressed a hope that it would not be necessary to raise the price of gas, and said he thought it would be bad policy on the part of coal-owners to keep up the price of coal, as something would be sure to spring up that would tend to right it.

Mr. S. Spencer seconded the resolution; and it was unanimously agreed to.

Mr. A. J. Lambert, Dr. T. R. Adams, and Mr. W. Cash were then re-elected Directors, and Mr. Benwell was re-elected Auditor.

The Chairman, in replying to a vote of thanks, announced that the Directors had decided, subject to the sanction of the shareholders, to vote 25 guineas to the Surrey County Fund for the equipment of volunteers.

A vote of thanks to the officers and staff was also unanimously passed.

Mr. W. J. Russell and Mr. J. W. Helps replied; the latter emphasizing the remarks of the Chairman as to the good feeling existing, which would continue, he said, while the men were looked after as now.

The proceedings then terminated.

SHEFFIELD UNITED GASLIGHT COMPANY.

The Half-Yearly Report and Accounts.

At the forthcoming half-yearly meeting of the above-named Company, the Directors will report an increase of 120,675,000 cubic feet in the quantity of gas sold in the six months ending Dec. 31 last, as compared with the corresponding period of 1898; being 9·87 per cent. more. This augmentation in the consumption affords a further illustration of the continued popularity of gas for all purposes. The revenue from its sale was £117,692; residuals produced £55,066; and the total receipts were £181,688. The manufacture of gas cost £109,463 (coals figuring for £61,612); distribution, £12,929; and management, £5121—the total outlay being £136,690, leaving £44,998 to go to the profit and loss account, the balance on which is £64,338. The dividends recommended, which the Directors say have been fully earned, will absorb £42,392, and there will be a surplus of £3494 to add to the balance of £18,452 brought forward. The difficulty which the Company have experienced, in common with other gas undertakings, in obtaining delivery of coal, has necessarily caused the Directors much anxiety. Anticipating that there might be some trouble, a larger stock than usual was placed in the stores; and at the end of August the total quantity of coal and cannel in hand was 46,772 tons. Unfortunately, however, in September a portion of it was found to be heating, which compelled its immediate use; and the stock was thereby reduced by about 10,000 tons. But for this occurrence, the Company would have been able to tide comfortably over the winter. The Directors report that on the night of the 21st of December last a fire, the origin of which has not been ascertained, resulted in the destruction of the Company's sulphuric acid works, and also of a portion of the buildings containing the sulphate of ammonia plant. The whole of the premises were, however, insured.

The Barnsley Town Council last Tuesday endorsed the acceptance of a tender by the Water Committee for the pipes required for the pipe-line from their new reservoir at Midhope to the proposed service reservoir at Wortley. The successful tenderers were the Stanton Iron-Works Company; and the amount of their offer was £17,700. The pipes are to be delivered by March 1, 1901. Owing to the present price of iron, and for engineering reasons, the contract for the pipe-line from Wortley to Barnsley is being held in abeyance.

TOTTENHAM AND EDMONTON GAS COMPANY.

The Half-Yearly Report and Accounts.

The statement of accounts which the Directors of the above-named Company will present at the half-yearly general meeting next Saturday shows an increase of 28,804,300 cubic feet, equal to 10·74 per cent., in the sale of gas for the latter half of last year, as compared with the corresponding period of 1898. The extra demand was experienced alike with ordinary and "coin" meter supplies, as well as with stoves for both cooking and heating. The revenue from the sale of gas amounted to £44,425; the sale of residua'ls brought in £7466; and the total receipts were £55,351. The expenditure on the manufacture of gas, inclusive of the cost of coal and oil (£11,845 and £7548) was £31,876; on distribution, £6070; and on management, £1939—the total being £44,281. The balance carried to the profit and loss account is therefore £11,070; and the amount available for distribution, inclusive of £1693 brought forward, is £11,386. The Directors recommend a dividend at the rate of 6 per cent. per annum on the "A" stock, and of 4½ per cent. per annum on the "B" stock, less income-tax. The payment of these will absorb £8929, and leave £2457 to be carried forward. Reference is made in the report to the loss sustained by the Company by the death last October of Mr. W. H. H. Broadberry, the Engineer and Manager, to whose faithful services for a period of 25 years testimony is borne. The appointment of his son, Mr. Arthur E. Broadberry, to fill the vacancy is announced. The working statements for the half year show that 15,117 tons of coal and 521,708 gallons of enriching oils were employed in the manufacture of 310,515,000 cubic feet of gas, of which 296,947,000 cubic feet were sold. The estimated quantities of residuals produced were: Coke, 9070 tons 4 cwt; breeze, 2526¼ chaldrons; tar, 252,048 gallons; and ammoniacal liquor, 4199 butts. The quantity of sulphate of ammonia made was 128 tons 11 cwt. Of the total bulk of coke produced, 2110 tons 15 cwt. were used in the manufacture of coal gas, 2906 tons 19 cwt. in the production of carburetted water gas, and the rest was sold, together with a portion of the stock, which was reduced from 433 tons 18 cwt. on June 30 to 50 tons at the close of the year. As has been the case with other gas companies, the Company experienced towards the close of the past year and during last month great difficulty in obtaining the quantity of coal required for keeping up the manufacture of gas; and the Directors were obliged to make special purchases. Fortunately, they were able to maintain a full supply of gas to the consumers.

THE PRICE AND ILLUMINATING POWER OF LONDON GAS.

The following is the statement on the above subjects which has been issued to the shareholders of the South Metropolitan Gas Company, as mentioned in the half-yearly report adopted at the meeting last Wednesday. It is signed by Mr. George Livesey.

The evidence given by representatives of the consumers before the Metropolitan Gas Companies (Powers of Charge) Committee of last session made it perfectly clear that a low price of gas was by far the chief *desideratum*. The illuminating power, within a range of 2 or 3 candles, is practically of no importance, because it is entirely in the hands of the consumer. By the use of bad ordinary burners, he often reduces 16-candle gas to 8 candles, or less (the burners commonly used generally give about 10 candles), whereas by the best burners he can get 16 candles, or perhaps a litt'e more. With Siemens or Wenham burners, over 30-candle power can be obtained; with the original Welsbach, 60 candles; and with the improved Welsbach, he has it in his power to make it anything up to 100 candles, or more. The gas company has no control whatever over the method of burning adopted by the consumer.

It is distinctly to the disadvantage of the consumers to have gas of a higher illuminating power than can be obtained from the available supply of coal, because it necessitates "enrichment," which costs the consumer considerably more than it is worth.

The London Companies being under the sliding-scale, between 80 and 90 per cent. of the cost of enrichment is borne by the consumers. If the full sliding-scale dividend is not paid, the consumer bears all the cost of enrichment, and the company none of it. The South Metropolitan Company could now raise its price 4d. per 1000 cubic feet with a reduction of only 8d. per cent. of dividend—viz., from £5 6s. 8d. to £5 6s. per cent. Enrichment is not only expensive, it is also uncertain, and generally unsatisfactory.

The only supply of gas coal practically available for London is from the Durham coalfields, seaborne. The railway carriage on Yorkshire coal adds so much to the cost as to render its use impracticable.

Durham coal will not now produce 16-candle gas. The quality of Durham coal is slowly deteriorating, owing to the best gas-coal seams being gradually worked out.

There are three methods of enrichment: (1) By an admixture of cannel gas. (2) By petroleum spirit used by this Company. (3) By carburetted water gas.

No. 1 is unquestionably the best, and the only method that can be considered thoroughly satisfactory; but cannel has become too scarce and dear to be available. When the price of cannel was reasonable, to raise the quality 1 candle cost about 2d. per 1000 cubic feet.

No. 2 is simple and comparatively cheap; but it is uncertain, and cannot always be relied upon to carry the enrichment all over the district. The cost, as given in "The Chemistry of Manufacturing Processes" by Blount and Bloxam, is about 1d. per candle per 1000 feet.

No. 3 is also comparatively cheap; but there are serious objections to its use. Its heating power is lower, and it is not so suitable for lighting, heating, or power as ordinary unmixed coal gas.

A very large proportion of gas is now used for its heating power in various forms—how much it is impossible to say; but during about eight months of the year at least 50 per cent. of the South Metropolitan gas is used during daylight hours, and a large proportion during hours of darkness is also used for heating. Enrichment of gas used for power or manufacturing purposes, cooking, or heating is waste of money.

The Metropolis Gas Act of 1860 fixed the illuminating power at 12 candles, tested by samples from bulk at testing-places "as near as may be 1000 yards from the works." Dr. Letheby, the Official Gas Examiner for the City Corporation, stated in evidence on that Bill that ordinary coal gas lost almost exactly 2 candles in travelling the three miles from the gas-works at Bow Common to the City.

The South Metropolitan Gas Act of 1869 increased the illuminating power to 14 candles; the testing-places to be "as near as may be, but not less than, 1000 yards from the station from which the gas to be tested thereat is supplied;" and by the Company's Act of 1876, the illuminating power was increased to 16 candles.

This raising of the standard is due to the fact that, whenever a gas company applies to Parliament for further powers, the local authority generally presses for an increase of illuminating power, under the impression that thereby something to the advantage of the consumers will be extracted from the company. This view is obviously unsound; the fact being that the whole cost of the increased standard will be borne by the consumers of gas. Almost all gas companies pay full dividends; and any increase in the cost of gas making either causes an increase in the price of gas or retards a reduction of that price.

Parliament has thus been misled, with the result that gas companies, as a rule, are now obliged to supply gas of a higher quality than can be obtained from the available supply of coal—necessitating enrichment in some form, which always costs the consumer more than it is worth. In fact, so far as the consumer is concerned, when proper burners are used, the difference between 14 and 16 candle gas is inappreciable. It is not a deficiency of illuminating power, but an insufficient supply—*i.e.*, short quantity or low pressure—that brings complaints from consumers.

The illuminating power of gas cannot by any possibility be maintained at one uniform standard. It is subject to considerable fluctuations from causes absolutely beyond control. Coal varies in quality from different pits and different seams. At one time it may be used freshly wrought and dry, at another it may be wet, or it may have been in store a long or a short time. All these circumstances affect the quantity and quality of the gas. Even a change of wind, causing a variation in the heat of the retorts, and changes of weather from warm to cold or from dry to damp, cause variations, and render it impossible to supply gas of uniform quality.

Further, gas testing is not by any means an exact operation, even with all the scientific refinements and precautions possible in a properly fitted-up testing-place. The tests have become more stringent, and some of the testing-places have been fixed at a greater distance than 1000 yards from the works, though the principle of testing by samples from bulk taken from leading mains is still maintained. This is the universal practice all over the kingdom, both for corporations owning gas-works and for gas companies. Again, gas loses sometimes more and sometimes less by travelling through the pipes. All these elements of uncertainty compel the companies, in order to be on the safe side, to enrich their gas to an average at the testing-places of something over 16 candles, although there is no penalty until the quality falls to 15½ candles.

Parliament has known since 1860, by Dr. Letheby's and other evidence, that gas loses considerably in illuminating power in travelling from the works to the consumer, and, knowing this, has invariably prescribed an illuminating power to be tested either at the works or at some central position by samples from bulk. In fixing the standard, surely Parliament acted on this knowledge. If, for instance, it had been the intention that London gas should be of 16-candle power tested at the houses of the consumers anywhere and everywhere, the quality, as tested by samples from bulk at 1000 yards from the works, would surely have been fixed at 18 candles at least. In fact, if London gas is to be of 16-candle power tested anywhere by the portable photometer, the Companies will have to enrich it to at least 18½ candles.

This raises three questions: (1) How is it to be done? (2) What will it cost? (3) Who is to pay for it? The answers are: (1) Only by enrichment with a large proportion of water gas. (2) The cost will be from 2d. to 3d. per 1000 cubic feet, at least. (3) The price of gas must be raised to cover the increased cost.

Further, the position of the Companies is at present sufficiently difficult and uncertain. They endeavour to supply, and believe that from day to day they are supplying, gas up to the standard; but the examination of the official returns every morning is always accompanied by anxiety lest there should be an adverse report. If the portable photometer were legalized, this uncertainty, which in various ways is to the disadvantage of the consumer, would be greatly increased. Either the portable photometer must be very unreliable, or all the elaborate and delicate arrangements for testing, as prescribed by the Referees for the legal testing-places, are unnecessary and useless.

The Gas Companies are at present subject to certain penalties if the illuminating power falls to 15½ candles or lower, unless it be the result of unavoidable cause or accident. The penalties are adjudicated by the Magistrate of the Police Court, and are a charge on the dividend, though, so far as this Company is concerned, they have never affected the dividend in the slightest degree. The proceedings, however, are a cause of great annoyance to the Company, because every failure is treated as if it were a wilful and almost criminal offence. I have for a long time told the officers of this Company not to trouble themselves when they receive an adverse report, but to treat it with indifference, knowing as I do that they have done their best, and knowing also from my own experience, when Engineer to the Company, the worry and anxiety caused by this vexatious system. In place of it, the Company's Bill proposes to substitute a system whereby the sliding-scale of price shall be extended to include quality also. This was suggested many years ago by Mr. Vernon Harcourt, F.R.S., then, and now, one of the Gas Referees. The Bill provides that the initial price under the sliding-scale shall vary according to the illuminating power of the gas, as shown by the average of all the testings every half year. If the average is above 16 candles, there shall be no alteration in the initial price. If the average is between 15 and 16 candles, the initial price shall be reduced 1d., necessitating an *actual* reduction of dividend for the half year, unless the price has been reduced 1d. per 1000 cubic feet to the consumers. If the average quality is between 14 and 15 candles, the initial price shall be reduced for that half year another 1d.; but should any test fall below 14 candles, the Company to be liable to the same proceedings and penalties as are at present in force when the quality falls below 16 candles.

The question that will be raised, supposing the principle to be approved, is whether 1d. reduction of the initial price for each step downwards is a fair proposal. It is not possible to determine this exactly; but I should not have made the proposal if I did not think it fair. *The Company desires to give the whole of the saving, whatever it may be, to the consumers.* The object is to cheapen the price of gas, which is as necessary to the Company to enable it to maintain its position against the strong competition to which it is exposed, as it is desired by, and is to the advantage of, the consumers.

But supposing the 1d. reductions of initial price are not the exact equivalent of the gradations of quality, the sliding-scale supplies the correction either way. Whatever the saving may be, between 80 and 90 per cent. of it would go to the consumers in any case. The working will therefore be as follows: The present quality is 16 candles, with 15½ candles as the minimum for any day. The average is rather over 16 candles. Without enrichment, the average quality will fall to something between 15 and 16 candles. This will reduce the initial price 1d., and will by the Bill, which adopts the proposal of the Powers of Charge Committee, reduce the dividend 2s. 8d. per cent., or about £7500 a year. If the shareholders are not to lose this £7500—or £3750 for the half year—the price of gas must be reduced 1d. per 1000 cubic feet, which will give the consumers over £21,000 in the half year. If the saving from the discontinuance of enrichment amounts to more than 1d. per 1000 cubic feet, the reduction to the consumer will be greater; or if the saving should be less than 1d. per 1000 feet, the reduction of price will be less. Consequently, any inequality will be met by a self-acting adjustment. The Company, true to its traditions of the last forty years, and more especially since the advent of the sliding-scale, recognizes that it is its interest as well as its duty to sell gas at the lowest practicable price.

I expect that unenriched gas will average about 15½ candles, and that it will seldom fall below 15. The Bill provides for a possible reduction of illuminating power to a minimum of 14 candles. The late Dr. Letheby said this was the proper standard for London. If, therefore, it should be found advantageous to the consumers to make such reduction, the Bill, if passed, will confer the necessary power. At any rate, it prescribes limits within which actual working experiments can be made to ascertain, and to practically adopt, the most suitable standard of illuminating power for London.

The probably rapid improvement and cheapening, leading to the general adoption, of the incandescent system of lighting, may in the early future render a further great reduction of illuminating power, and consequent cheapening of the cost, of gas advisable—its heating power becoming then the chief, if not the only, consideration. The ideal which may soon become practicable is cheap non-luminous heating gas, and universal incandescent lighting. The latter has already been realized to the extent of 85 per cent. in Central Germany.

A few words on the new sliding-scale. The provision in the Company's Bill differs from the recommendation of the Committee only in that their double scale is made single. The proposal of the Committee, adapted to the Company's converted capital, is that there shall be an increment of 2s. per cent. for each 1d., and a further 2s. per cent. for each 3d., variation in the price of gas. The Bill puts it at 2s. 8d. for each 1d. The Bill also adopts the recommendation of the Committee that the initial price shall be reduced to 3s. 3d. This gives the Company a slight nominal advantage when gas is sold at less than 2s. 6d. per 1000 feet, on the intermediate pennies; but it is so slight as to be of no practical importance, for no one would think of increasing a dividend by so small a sum as 8d., or even 1s. 4d., per cent. per annum.

The Company's present standard of increase of dividend of 2s. per cent. for each 1d. reduction in price raises the point mentioned by Mr. Haward in his evidence (Questions 199-201). He said in effect that the increment of dividend has now become so small for 1d. reduction as to fail to be an incentive to a company to reduce their price. This is perfectly true. Taking the actual price paid under the auction clauses for this Company's stock—viz., £140 per cent.—the increase of dividend is only 2s. per cent. on the nominal, and only 1s. 5d. per cent. on the actual, investment. The sliding-scale has, therefore, become inoperative, because the price must be reduced nearly 4d. per 1000 feet before the shareholder can get an increase of ¼ per cent. on his investment, or over £150,000 to the consumers before the shareholders become entitled to £14,000 increase of dividend.

The Committee consequently made a move in the right direction by taking something off at one end and adding at the other; but it may be a question whether they went far enough in this direction to restore the sliding-scale to its original purpose—viz., to offer an inducement to reduce the price of gas.

PROVINCIAL GAS AND WATER COMPANIES.

Gas Companies.

The revenue of the Airedale Gas Company for the past year amounted to £6545, and the expenditure to £3966—leaving a balance of £2579; being £1292 for the past, and £1287 for the preceding, six months. The gas sold during the past half year was 18,741,100 cubic feet, which, added to the June portion (16,705,400 cubic feet), makes a total for the year of 35,446,500 cubic feet, or an increase of 5,647,000 cubic feet over the sales for 1898. Residuals produced an income of £213 in excess of that of the previous year. On the other hand, coal, wages, and materials of every kind increased in value; making the cost of production greatly in excess of the year 1898. At the ordinary general meeting of the Company held on Monday last week, the Directors' report, in which they recommended the payment of dividends of 5 and 3½ per cent. on the different stocks, was adopted.

The revenue account of the Bath Gas Company for the six months ending Dec. 31 amounted to £36,729; the sale of gas for public and private lighting producing £27,749, and the residuals realizing £6601. The expenditure on the manufacture of gas came to £20,987 (coal costing £15,207); on distribution, to £3905; on management, to £1527—the total being £28,428. The balance carried to the revenue account is £8301; and the amount available for distribution is £12,029, which will enable the Directors to pay the maximum dividends. There was an increase of 11 million cubic feet, equal to nearly 5 per cent., in the consumption of gas during last half year, compared with the corresponding period of 1898; and there was a satisfactory improvement in the revenue from residuals, which helped to meet the extra cost of coal.

The half-yearly meeting of the Bristol Gas Company was held on Thursday, when Mr. J. W. S. Dix submitted the report of the Directors which was noticed last week. He thought the shareholders might congratulate themselves on the result of the trading of the past and preceding half year. There had been a very satisfactory increase in the sale of gas. Notwithstanding the reduction in the price by 1d. per 1000 cubic feet from July 1, the revenue account showed a balance of profit, after providing for interest on debenture stock and the dividend on the ordinary stock, of £3124. There had been an increase in gas-stoves of 1271, prepayment meters 833, ordinary meters 1244, and new services 2036. As an instance of the way in which business was expanding, he mentioned that there had been an increase of 7½ per cent., or about 38 million cubic feet, on the output of gas in the half year. The call upon their supply the last few days had been severe; the increase during the fortnight being 11,698,000 cubic feet. With all their prosperity, however, the Directors had not been free from anxiety. They had been very anxious with regard to coal. They had pulled through so far; and he hoped they would do so to the end without a check. The rise in the price of coal had been a great temptation to some people to profit by supplying outsiders. But the Company had been dealt with fairly; and their contractors had done what they could, although the Directors had had to keep them up to the mark. Notwithstanding the increase in the price of coal, the Directors had not increased the price of gas, nor did they intend to do so unless they were absolutely obliged to by the markets being against them. The report was adopted, and the dividend declared.

The development of the Bromsgrove Gas Company during the past four years has been equal to 50 per cent. This was the pleasing statement made by the Chairman (Mr. John Green) at the meeting of the shareholders yesterday week. In view of the enormous increase, it is not surprising to learn that it is the intention of the Directors during the present year to make further improvements and extensions at the works, a large portion of the expenditure on which will be charged to revenue. It is therefore proposed to call a special meeting to sanction the issue of £4000 in "B" shares. Including the amount of £738 brought forward from 1898, the accounts showed an available balance of £2023, out of which a dividend of 7½ per cent. on the ordinary shares and seven-tenths of 7½ per cent. on the "B" shares for the year, free of income-tax, is to be paid.

The annual meeting of the Calverley and Horsforth District Gas Company was held last Wednesday. The report disclosed an available balance of £2939; and it was decided to pay the statutory dividends at the rate of 10 and 7 per cent.

The annual meeting of the Colchester Gas Company was held last Friday—Mr. C. Coleman, the Chairman, presiding. The Directors, in their report, congratulated the shareholders on the year's work. Under the supervision of their Manager (Mr. H. S. Pike), they had made 2,681,000 cubic feet more gas than in the previous year, or an increase of 2¼ per cent. It was satisfactory to notice that gas was more generally employed for heating and cooking purposes than formerly, and that its use for motive power was more fully recognized. They could, therefore, anticipate a large increase in its consumption for other purposes than lighting. The report was adopted.

The annual meeting of the Halesowen Gas Company was held last Wednesday—Mr. C. E. Bloomer, the Chairman, presiding. The report for the past year submitted by the Secretary (Mr. D. W. Sluter) showed a considerable improvement upon previous years; and it was also pointed out that the exhibition of gas appliances held in April last was attended with satisfactory results. There had been an advance in returns from residual products, and the price of gas had been reduced during the year, which had given general satisfaction. The Directors recommended a dividend of 7 per cent. on the "A" shares, and £4 15s. per cent. on the "B" shares. The Chairman, in moving the adoption of the report, congratulated the shareholders upon the continued prosperity of the Company. The report was adopted.

At the annual general meeting of the Hoddesdon Gas Company next Monday, the Directors will have the pleasure of drawing the shareholders' attention to the satisfactory increase in the sale of gas, and the consequent higher profit, which characterized the working in the past year. The gas-rental amounted to £3543; and the total receipts were £4355. The expenditure was £2643; and the balance £1712—an increase of £190 on that of 1898. The balance brought forward was £2292; and the amount available for distribution is £2591—in round figures, an advance of £300. The Directors will recommend dividends at the rates of 5 and 3½ per cent. for the past six months; making, with the interim dividends, 10 and 7 per cent. for the year. Under the supervision of Mr. Harry D. Duesbury, the Company's Manager and Secretary, several important renewals of plant have been carried out at the works, which are being maintained in good and satisfactory condition.

The annual report of the Directors of the Ipswich Gas Company states that the consumption of gas continues to increase rapidly; the quantity manufactured being 28,140,000 cubic feet in excess of the previous year. The residual products have also yielded a satisfactory increase. The expenditure has been much heavier, owing to the large rise in the cost of materials and labour; and unfortunately there is no immediate prospect of a fall in prices. The balance of profit and loss account is £16,958, out of which an interim dividend has been paid. The Directors recommend a further dividend at the full statutory rates; and a balance of £7079 will then remain to be carried forward. The completion of the new purifiers in the early part of last winter is also referred to; and it is mentioned that they are working satisfactorily.

The half-yearly meeting of the Kettering Gas Company was held last Tuesday—Mr. J. T. Stockburn presiding. The revenue account showed receipts amounting to £11,977, and expenses totalling £9760; leaving a balance of £2217. Dividends were declared at the rate of 11½ per cent. on the "A" stock, 8¼ per cent. on the "B" stock, and 5⅝ per cent. on the "C" stock.

The half-yearly general meeting of the Kingston-upon-Thames Gas Company was held last Thursday, when the Chairman (Alderman Bedford Marsh) moved the adoption of the Directors' report, the accounts accompanying which showed that the amount received for gas sold and the rental of meters and stoves was £27,561, and that the balance to the

credit of the profit and loss account was £4601. The payment of the usual dividend was recommended; and this was agreed to. The shareholders subsequently sanctioned the promotion of the Bill which the Company now have in Parliament.

The annual meeting of the Longwood Gas Company took place last Thursday—Mr. E. Armitage, J.P., presiding. The Engineer and Manager (Mr. J. H. Brearley), in response to the Chairman's invitation, made a few remarks upon the operations of the Company. The consumption during the past year was over 14 per cent. more than in the preceding one, and 47 per cent. more than it was three years ago. It had gone up from 39 to more than 57 million feet. In the three years, the number of meters had increased from 2300 to 3664; and the leakage had been reduced from 16 to 7½ per cent. The Chairman, in an interesting speech, paid a high tribute to the manner in which the Engineer had served the Company. In moving the adoption of the report and accounts, he alluded to the upward tendency of rates and taxes, which was represented by a sum of no less than £539. The dividend of 7½ per cent. which the Directors recommended to be paid was 1¼ per cent. more than in 1898, and 2½ per cent. more than in 1897. The last time a dividend of 7½ per cent. was paid was in 1892. The Corporation of Huddersfield were laying electric cables in the Longwood district; but the Directors did not anticipate any appreciable diminution in the consumption of gas, for hitherto the electric light had proved itself both fickle and expensive. Although the consumption during the past year for private purposes showed a large increase, there was actually a decrease in the quantity of gas used for public lighting. This arose through the lighting authorities of one district deciding to extinguish the lamps for five nights at each moon. Some people had blamed the Gas Company for this, whenever the moon withheld its patronage; but it was well that it should be understood that they were not the lighting authorities, but simply supplied the gas according to contract. The report was unanimously adopted; and dividends were declared at the rate of 7½ per cent. on the original, and 5¼ per cent. on the new ordinary shares.

At the annual meeting of the Newcastle-upon-Tyne and Gateshead Gas Company to-morrow, the accounts submitted will show that the revenue in the past year amounted, to £302,920; the expenditure to £222,304—leaving a balance of £80,616. Adding the balance brought forward, a total of £84,195 is produced. After payment of the interest on debentures, loans, &c., and dividends at the rate of 5 per cent. per annum on the preference, and of 9¼ per cent. per annum on the ordinary stock, less income-tax, and adding £8000 to the reserve fund, there will be a balance of £3406 to be carried forward. In the course of the year, 234,217 tons of coal and 13,008 tons of cannel were carbonized; the quantity of gas made being 2,676,872,000 cubic feet, of which 2,373,956,000 cubic feet were sold and 2,405,764,000 cubic feet accounted for. The bulk of gas delivered last year was an increase on that sent out in 1898. The quantities of residuals produced were: Coke, 149,851 tons; breeze, 14,574 tons; and tar, 2,353,867 gallons. Sulphate of ammonia to the amount of 2113 tons 12 cwt. was made and sold, together with about 31 tons of what was in store. The Directors report an improvement in the markets for residuals. The extension of the manufacturing, storing, and distributing plant continues. The carbonizing and purifying plant at Redheugh is complete, and the stoking machinery working satisfactorily.

The half-yearly general meeting of the Newport (Mon.) Gas Company was held on Monday last week—Mr. R. Laybourne presiding, in the absence of Mr. E. J. Phillips, J.P., the Chairman of the Company, who was seriously ill. A resolution, expressing the shareholders' sympathy with Mr. Phillips, who has been a Director of the Company for 48 years, for 18 of which he has occupied the chair, having been passed, Mr. Laybourne moved the adoption of the report and accounts. In doing so, he expressed his pleasure that there had been an increased demand for gas during the past half year, and that they had earned sufficient profit to pay the statutory dividend without resorting to their reserve fund, which they had to do in the corresponding half of 1898. The sale of gas was very encouraging, and it was in a great measure owing to the adoption of penny-in-the-slot meters, which appeared to have supplied a long-felt want. A marked improvement in the value of residuals sold had also assisted them. The adoption of gas cookers and fires for domestic purposes had added to the consumption of gas. The increase in the quantity sold amounted to £2891, and in residuals to £1167; making together £4058, which enabled them to increase the balance on the profit and loss account by £3461. This was earned with an additional expenditure of £597. In answer to questions, the Chairman said the loss from robberies from prepayment meters was very insignificant. They had in use 3296 of these meters, 4026 cookers, and 1589 gas-fires. The report was adopted; and the usual dividends were declared. A vote of thanks having been accorded to the Chairman, Directors, and officials of the Company, for their able and energetic services, the Chairman replied, and referred to the assistance the Directors received from the officials, for whom Mr. T. Canning, the Engineer and Manager, and Mr. E. F. Marfleet, the Secretary, briefly responded. The meeting then closed. Subsequently, a special meeting was held to consider the Bill which the Company now have in Parliament to enable them to convert the existing, and raise further, capital. Some explanations having been given by the Chairman, he moved the approval of the Bill; and the motion was carried unanimously.

The half-yearly report of the Pontefract Gas Company states that the amount divisible is £1508, out of which the Directors recommend a dividend at the rate of 10 per cent. per annum on the original shares, and of 7 per cent. per annum on the new ordinary shares.

The accounts presented at the recent annual meeting of the St. Austell Gas Company showed that the revenue from the sale of gas and the rental of meters in the past year amounted to £1980, and that the total receipts were £3358. The expenditure being £3014, there was a balance of £344 to go to the net revenue account. In their report, the Directors stated that the increase in the consumption of gas had been 11 per cent.; while the number of consumers had increased also from 416 to 450. The improved furnaces erected in the retort-house had effected a considerable saving in fuel, as shown by the increase in the sales of coke, the receipts for which had risen from £349 to £449. The Directors recommended a dividend at the rate of 7 per cent. per annum.

The report and accounts of the Wakefield Gas Company for the half year ended December last have been issued. The report states that the balance available for distribution is £7893; and the Directors recommend the payment of the usual dividends at the rate of 11½ per cent. per annum on the 1000 shares of £25 each, and also on 3660 shares of £5 each; of 9 per cent. on 7340 "B" 5ths shares of £5 each; and of 8½ per cent. on the 2500 new ordinary £10 shares (£4 paid).

At the annual meeting of the Walker and Wallsend Union Gas Company held last Friday, the report of the Directors, noticed in the "JOURNAL" for the 6th inst., and the accounts, were taken as read. In moving the adoption of the report, the Chairman (Mr. T. Crawford) referred to the high price of coals, which, he said, would probably cause the price of gas to be increased at an early date, when the existing contracts expired. The dividend for the second half of the past year at the rate of £4 12s. 6d. per cent., less income-tax, making £9 5s. for the year, was agreed to. At the close of the general business, an extraordinary meeting was held, when the following resolution was passed: "That this special meeting of the proprietors of the Walker and Wallsend Union Gas Company, having had submitted to them the Bill now being promoted by the Company, intituled, 'A Bill to enable the Walker and Wallsend Union Gas Company to supply electricity within the borough of Jarrow and urban district of Hebburn, in the county of Durham, to raise additional capital, and for other purposes,' approve of the said Bill, subject to such additions, alterations, and variations as Parliament may think fit to make or sanction therein."

At the meeting of the Waltham Abbey and Cheshunt Gas Company next Friday, the accounts presented will show that the revenue in the six months ending Dec. 31 was £5337; and the expenditure, £3732—leaving a balance of £1605. There is a sum of £2349 available for distribution, as compared with £2156 this time last year; and the Directors will recommend dividends at the rates of 7½ per cent. per annum on the "A" and of 5½ per cent. per annum on the "B" and "C" shares, less income-tax. Under the supervision of Mr. W. Bince Randall, the Company's Engineer and Manager, 2068 tons of coal were employed in the manufacture of 22,491,000 cubic feet of gas, of which 18,485,000 cubic feet were sold for private lighting, and 21,509,000 cubic feet accounted for. The quantities of residual products are estimated as follows: Coke, 1261 tons; tar, 18,609 gallons; ammoniacal liquor, 574 butts of 108 gallons. There were 22 tons of sulphate of ammonia produced in the six months covered by the report.

The balance-sheet of the Yeadon and Guiseley Gas Company for the past half year shows an income on revenue account of £6360, and an expenditure of £5069; thus leaving a profit of £1291. This will pay the maximum dividends of 10 and 7 per cent. per annum on the two classes of stock, and leave a balance of £88 to be carried forward.

Water Companies.

It was reported at the half-yearly meeting of the Camborne Water Company last Tuesday that, owing to the drought in the past summer, the supply of water for trade purposes had to be discontinued for a short time. A new 10-horse petroleum engine had been added to the pumping plant, and the underground cutting had been extended, with the result that a good stream of water had been added to the supply. Further work of this kind was to be undertaken, in the hope that more water would be obtained. The accounts showed an available balance of £743; and the Directors recommended the payment of dividends at the rate of 9 per cent. per annum on the "A" shares, and £6 6s. per cent. per annum on the "B" shares. Mr. W. C. Pendarves, the Chairman, in moving the adoption of the report, said the expenditure showed a slight increase, owing to the extra pumping charges. The Directors proposed to carry to the capital account the balance of £128 left after payment of the dividends, in order to cover the cost of driving fresh adits. The drought of last summer, besides inconveniencing their customers and causing the loss of the sale of water, cost the Company £150 in pumping charges. Mr. Vivian suggested that another reservoir should be provided. He said it was a serious thing that the trade supply should be cut off at a busy period. The Chairman said the Directors felt that it was a most serious matter. If they could see their way to increase the storage, they would do so. The report was adopted.

The 63rd half-yearly ordinary general meeting of the Cleveland Water Company was held at Saltburn last Wednesday—Mr. W. H. R. Wharton, J.P., presiding. The Directors' report showed that, after providing for all expenditure, there remained a balance of £4872; enabling them to recommend a dividend at the rate of 9½ per cent. per annum on the original and "A" shares, and £6 13s. per cent. per annum on the "B" shares (free of income-tax), and leaving £125 to be reserved for contingencies. This would absorb £3355, and leave £1517 to be carried to the credit of the next half-year's account.

There was a ring of prosperity throughout the proceedings at the half-yearly meeting of the Colne Valley Water Company last Tuesday. The Chairman (Mr. J. R. Holland) presided. His first words were that he had frequently on these occasions—particularly of late years—had to congratulate the shareholders on the increased prosperity of the Company; and now he had double reason for doing so, for the past year had been the most prosperous in the history of the concern. To illustrate this, he gave the amounts of the water-rates for the past four years. In 1896, the sum received was £16,712, in 1897 £17,946, in 1898 £19,623, and in 1899 £22,284. The last figure was a gain of £2661 upon the previous year, which was a much greater advance than had ever before been experienced. The new supplies showed the cause for the increase in the water-rates. The number laid on in 1896 was 419, representing an annual rental of £883; in 1897, 399, representing a rental of £934; in 1898, 551, representing a rental of £1233; in 1899, 702, representing a rental of £1800. The total amount received from building supplies in 1896 was £530, 1897 £673, 1898 £810, and 1899 £1227. As to the expenditure of the half year, the fuel bill was decidedly higher, owing to the increase in cost and the larger quantity of water pumped. The total consumption of water in 1899 was 527 million gallons, which was 41 millions more than in 1898; the increase being due to the large number of additional consumers, and to the long dry season. The Directors were able to propose a dividend at the rate of 6 per cent. per annum, against 5 per cent. for the corresponding half of 1898, and to carry forward £1090, as compared with £390. In three years, there had been an increase of 2 per cent. in the dividend. Additional capital was now necessary. The large new service reservoir at Bushey Heath was nearly completed; and other works were now required to meet the demands of the district. All the capital authorized had been raised; and

the capital account was overdrawn to the extent of £2086. It was therefore proposed to create 3000 new £10 shares, either wholly, or partly, ordinary and 4 per cent. preference shares. To meet immediate wants, it was only intended to issue 1200 of the shares at present. Mr. C. E. Keyser seconded the motion; remarking that he looked forward with no apprehension to the large additional capital expenditure the Directors were asking the shareholders to authorize. Everything they had done in this direction had paid them well. Mr. Hepburn favourably commented upon the position of the Company financially, and in connection with the works and the supply. The report was adopted, the dividend was declared, and the retiring Directors and Auditors re-elected. A special meeting was then held, at which a resolution was passed giving the Directors authority to create 3000 new £10 shares. In explaining the nature of the new works which it was proposed to carry out, the Chairman mentioned that the nearly completed service reservoir would bring up the storage capacity to close upon 7 million gallons in place of 2½ millions.

At the annual general meeting of the Consett Water Company last Friday, the Chairman (Alderman U. A. Ritson), in moving the adoption of the report, noticed in the "JOURNAL" a fortnight ago, said the Company had purchased the plant, works, and goodwill of the Chester-le-Street Water Company (who supplied that place with water prior to the advent of the Consett Company laying pipes in the town in 1888) for £2000. By acquiring this undertaking, the Directors had removed all opposition, and had obviated the friction which would necessarily be caused between two distinct Companies supplying a small place with water. There had been expended during the year, on the maintenance of plant, works, &c., £7067. The report was adopted. Dividends at the rate of 4 per cent. per annum (subject to the deduction of income-tax) on the preference shares, and of 6½ per cent. per annum on the ordinary shares—making an average for the year of 6¼ per cent.—were ordered to be paid, absorbing £7082 of the £10,453 available; the balance of £3371 being carried forward.

The Frimley and Farnborough District Water Company held their ordinary meeting on the 10th inst., when the Directors reported that for the half year ending Dec. 31 there was a net balance of £1102 available for distribution. Out of this they recommended the declaration of dividends at the rates of 5 and 4 per cent. per annum, the payment of which would leave a balance of £382. In moving the adoption of the report, the Chairman (Mr. A. C. Pain) referred to the satisfactory growth of the Company, as shown by the fact that 180 houses had been supplied, and 12 meter connections made, during the period covered by it. The service mains had been extended about two miles; making a total length of 62·94 miles. A proof of the confidence of the public in the management of the Company was afforded last November, when 700 of the new £10 shares were sold at an average price of £12 1s. 9d. each. The report was adopted, and the dividends recommended were declared.

At the recent annual meeting of the Marlow Water Company, at which General Sir G. W. A. Higginson presided, the report, which was adopted, stated that the revenue of the Company continues to increase; the water-rental for the past year amounting to £1680, as against £1442 in 1898. At the same time the expenditure increased from £886 to £1039. The balance to the credit of the profit and loss account was £1315, against £1177—an increase of £138. From this the Directors recommended the payment of a dividend at the rate of 6 per cent. on the original, and £4 4s. on the additional, shares.

The revenue of the Newcastle and Gateshead Water Company continues to make a steady and substantial increase. The gross receipts for the past year amount to £148,827; and after deducting working expenses, interest, and the interim dividend, there remains £52,006. The Directors recommend the payment of the dividend on the preference stock, £18,581; a dividend at the rate of 9 per cent. per annum on the ordinary stock, making 8½ per cent. for the year, £17,477; and a dividend at the rate of £6 6s. per cent. on the ordinary stock, making £5 19s. per cent. for the year, £10,080—leaving £5867 to be carried forward. The report mentions that the drought of 1898 was continued during the past year. From June until December, no increase in the store of water took place. The Directors, however, are pleased to state that this did not in any way affect the full and unrestricted supply throughout the district. Since the opening of the year, there has been a large increase of water into the reservoirs; and the quantity now in store is 2716 million gallons out of an available storage capacity of 3060 million gallons. To meet growing demands, the Directors have determined, during the present year, to lay the new trunk main from Whittle Dene to the proposed reservoir at Byker, for which land has already been purchased. It is also intended to carry out other important extensions of main pipes, and to construct the new aqueduct and tunnel between Hallington and Whittle Dene. The large reservoir on the River Rede is making satisfactory progress.

The water-rental of the Sunderland and South Shields Water Company in the past year amounted to £82,494. The expenditure being £45,415, the balance carried to the profit and loss account is £37,049. The amount available for distribution is £44,469; and at the annual meeting next Thursday the Directors will recommend the following dividends for the six months ending Dec. 31: At the rate of £4 10s. per cent. on the ordinary and preference stocks, of £3 3s. per cent. on the additional capital stock (maximum dividend 7 per cent.), and of £2 5s. per cent. on the new (5 per cent. maximum) stock; making, with the interim dividend paid in September last, 9 per cent. on the ordinary and preference stocks, £6 6s. per cent. on the additional stock, and £4 10s. per cent. on the new 5 per cent. maximum stock for the year, free of income-tax.

OTTOMAN GAS COMPANY, LIMITED.

The Half-Yearly General Meeting of this Company was held last Thursday, at the London Office, No. 9, Queen Street Place.—Colonel JAMES LE GEYT DANIELL in the chair.

The SECRETARY (Mr. Thomas Guyatt) read the notice convening the meeting; and the report and accounts were taken as read.

The CHAIRMAN said he trusted the shareholders would regard the accounts as satisfactory, taking into consideration the circumstances of the seasons through which they had been passing. Dealing at once with the items in the balance-sheet, he said it would be observed that sundry creditors stood at £1182, which was something like £1700 less than for the corresponding period of 1898. But at that time the depreciation fund was included in the item; and it had since been invested in Consols. The bills payable were about £400 more; and this was on account of coal. The depreciation fund stood at £1657; but, on the other side, £1100 was entered as having been invested in Consols. The item also included the half-year's depreciation or sinking fund—£550—which had also since been invested in Consols. The sundry debtors amounted to £9799; but in the corresponding period, they were much greater (£18,512), because the capital expenditure was not then closed. Stocks were entered at £6383, which sum was somewhat larger owing to the fact that it included a greater quantity of coal. There was very little difference in the items on the expenditure side of the revenue account, except depreciation, renewals, and repairs, which were £1485, compared with £2486. The gas-rental was very satisfactory—the total being £10,487, as against £10,264. The income from bye-products was about the same—£2054. Leaving the figures, the Chairman said he thought he ought to mention that he was strongly urged by their Engineer (Mr. John Gandon) to pay a personal visit to Constantinople and afterwards to the works; and, in the interests of the Company, he went. Knowing several people there, he was in a position to inform himself very carefully of all that was going on; and he believed the result would be advantageous to the Company. As the shareholders were aware, their present contract was for forty years; but negotiations had been entered upon for securing an extension over the period they originally wanted—viz., seventy years. It was too soon to say anything definite in regard to this matter; but if they did get a prolongation to seventy years, it would be a great benefit to the Company, and would well repay the costly outlay they would have to incur on capital account, and which they would have to make as a consequence of getting the contract extended. Of course, it would not be seventy years from now, but from 1902. One of the immediate advantages would be that the sinking fund would be much lessened annually. The shareholders would know if the extension was agreed upon, as in that case it would be necessary to issue the balance—viz., £5000—of the £25,000 of debentures which the Directors were authorized to raise. While in Smyrna, he was immensely surprised and pleased with all he saw; and he took the opportunity of seeing everybody he could who was in a position to promote the interests of the Company. Among the gentlemen with whom he had interviews was the Vali, who was at one time the Turkish Ambassador in this country; and it was certainly an advantage to the Company to have a man at the head of municipal affairs in Smyrna who understood the manners and customs of the English people. Their Manager (Mr. Gandon) seemed to be very popular there; and everybody spoke very highly indeed of him. It afforded him (the Chairman) the greatest possible pleasure to personally see and hear these things; and he was sure the shareholders were equally pleased to hear the opinion he formed on the spot. The works were in excellent condition, and the new gasholder (which was capable of holding 250,000 cubic feet) was a splendid piece of engineering work. The condition of their affairs generally in Smyrna was most gratifying to him. He concluded by moving the adoption of the report and accounts.

Mr. CHARLES GANDON seconded the motion.

Mr. A. M. PADDON thought the statement of accounts was eminently reassuring; and the margin of profit was highly creditable to the administration. If anything exercised the minds of the proprietors of gas undertakings at the present day, it would be rather of a prospective than a retrospective character. The coal difficulty was a very great one; and it would be gratifying to learn that the Company stood secured with some little margin ahead of what they required.

The CHAIRMAN was happy to say that the present coal contract ran on to October next.

Mr. GANDON added that they had a second resource in some native coal—heraclia. Their Manager reported that it was a very good coal. It gave above 10,000 cubic feet of gas per ton, and could be obtained at a reasonable price.

The motion was unanimously carried.

A dividend at the rate of 7 per cent. per annum on both classes of shares having been declared,

On the motion of the CHAIRMAN, seconded by Mr. H. W. ANDREWS, Mr. Charles Gandon was re-elected a Director; and on the proposition of Mr. A. W. COOPER, seconded by Mr. WILKINS, the Auditors (Mr. C. K. Butt and Mr. T. H. Cooke) were re-appointed.

The CHAIRMAN moved, and Mr. J. TYSOE seconded, a vote of thanks to the Secretary, Manager, and staff.

The motion was cordially agreed to; and Mr. GUYATT responded on behalf of those included in the vote.

A similar compliment was paid to the Directors, on the proposition of Mr. W. HUGHES, seconded by Mr. PADDON.

An acknowledgment by the CHAIRMAN concluded the proceedings.

Chipping Norton Water Supply.—A special meeting of the Chipping Norton Town Council was held last Wednesday, to consider the steps to be taken to resist an injunction to restrain the Corporation from proceeding with their proposal to obtain an additional water supply. A scheme has been sanctioned by the Local Government Board, the money obtained, and the works are now in progress, to enable the Corporation to increase the water supply by tapping certain springs which flow into the River Glynne; but the owners of Lidstone Mill, situate on the river, are proceeding with an injunction to restrain the construction of the works, on the ground that the water will be diverted which is necessary for the full working of the mill. The Town Clerk was instructed to resist the application for an injunction.

The Quality of the Carmarthen Water Supply.—At the meeting of the Carmarthen Town Council last Tuesday, the report of Mr. H. P. Charles, the Borough Analyst, upon the water from Rock and Fountain, under the new gravitation scheme for the supply of the town, showed that, though it was of good quality for all purposes, it had a very marked action on bright lead. Mr. Charles added that, in his opinion, it would be very unsafe to use the water from lead pipes or cisterns for drinking purposes, as there would always be a danger of lead poisoning. The Town Clerk (Mr. R. M. Thomas) pointed out that the present water had been shown to have a similar action on lead; and eventually it was decided to send samples of both to Mr. Dupré for final analysis, he having previously stated that the Rock and Fountain water was safe for drinking purposes after it had been exposed in the proposed reservoir.

MANCHESTER CORPORATION GAS AND ELECTRICITY SUPPLY.

The Electrolysis Committee—The Gas Supply During the Severe Weather—Another Failure of the Electric Light.

At the Meeting of the Gas Committee of the Manchester Corporation last Friday, the Chairman (Alderman Gibson) and the Deputy-Chairman (the Lord Mayor) were appointed to represent the Committee on the Special Committee who, in accordance with the resolution passed at the last meeting of the Council (*ante*, p. 416), are to institute an inquiry as to the effects of electrolytic action on the gas, water, and other mains in the city. The Water Committee, it was mentioned, had already appointed their Chairman (Sir John Harwood) and Deputy-Chairman (Sir Bosdin T. Leech) as their representatives; and it was understood that the Electricity Committee were taking a similar course. This Special Committee will appoint experts to make the necessary investigations, and ultimately present a report to the Council.

It was stated that the Gas Department had got through its duties satisfactorily during the severe weather of the past week. The consumption of gas in that period showed an increase of more than 18 per cent. over the corresponding week of 1899. There had been very few complaints, even of stoppages on account of the frost; and the full supply of gas had been kept up throughout. This is a position which compares very favourably with that of the electric light supply, which, since the report we gave of the several breakdowns on the Manchester Royal Exchange, has been subject to numerous other more or less annoying vagaries; the most recent being a total eclipse at the Manchester Art Gallery reception last week.

WAGES AND CONDITIONS OF LABOUR OF BIRMINGHAM CORPORATION WORKMEN.

A General Movement—The Gas and Water Works Men Ask for Higher Pay

An agitation, which has been pending some time among the employees of the Birmingham Corporation for an improvement in their wages and conditions of labour, has taken the shape of a formal notice. The movement commenced early last year with the men working for the Health Committee. Deputations waited on the Committee; and, after some negotiations, concessions were granted, chiefly in regard to such matters as working hours and holidays. It was stated at the time that this was part of a general movement on behalf of the Corporation workmen. But the Committees concerned were not disposed then to make concessions, having in view the wages paid by other employers for similar work; and the officers of the Unions with which the men were connected did not think the time opportune for bringing strong pressure to bear. The Executives of the men's Societies have now sanctioned the making of a formal demand; and memorials have been sent in from about 4000 men in various Corporation departments asking for wages which represent an advance of 2s. a week all round. Among the men concerned are the stokers, engine-drivers, rough-fitters, machine-men, and wheelers in the employ of the Gas Committee; and the engine-drivers and stokers at the water-works. The stokers and machine-men in the carbonizing departments of the gas-works ask for an advance of 6d. a shift, and the wheelers for one of 4d. In support of their application, the men point to the high price of coal and the advance in house rents. The latter, it is stated, have increased during the past two years by from 6d. to 9d. a week. The memorials are being considered by the Committees; and the course to be taken by the men will be discussed as soon as the replies have been received. In the meantime, the Committees are to be asked to receive deputations from the men.

LOSS OF GAS AND DAMAGE TO MAINS AT SHREWSBURY THROUGH SEWERAGE OPERATIONS.

At the Quarterly Meeting of the Shrewsbury Town Council, yesterday week, the Special Committee appointed on the 1st ult. to consider the circumstances connected with the Shrewsbury Gaslight Company's claim of £1583 4s. 1d. for damage and loss arising from the shifting of their pipes during the main-drainage operations, reported that they had perused the correspondence which had passed between the Company's Solicitors and the Town Clerk; and that the Company having proceeded to arbitration and appointed Mr. Corbet Woodall as Arbitrator on their behalf, the Committee had selected Mr. J. H. Redman, Barrister-at-law, as Arbitrator on behalf of the Council. The two Arbitrators had appointed Mr. James Mansergh as Umpire. The Committee submitted for the information of the Council the whole of the correspondence with the Company affecting their claim. From this, it appeared that on the 2nd of Sept. last Messrs. Sprott and Morris, on behalf of the Company, wrote to the Town Clerk calling attention to the fact that serious damage had been, and was being, sustained by the Company, which would in due course become the subject of a formal claim for compensation. On Sept. 5, the Town Clerk replied that the letter would be laid before the Sanitary Committee; and on Dec. 4 Messrs. Sprott and Morris made a formal claim for the sum mentioned, and stated that, unless the claim was admitted, they were instructed to proceed to arbitration. On Dec. 15 particulars in detail were asked for, and supplied; and on Dec. 28 the Town Clerk was instructed to say that the Committee did not admit any damage, and denied all liability, and had no intention of entering into any compromise in respect to it. In a letter dated the 16th ult., Messrs. Sprott and Morris stated: "This last letter speaks for itself, and it must be remembered that it was not until after we had received it that the Gas Company appointed their Arbitrator, and we served the statutory notice thereof upon the Corporation. When these facts are known, we think it will be generally admitted that there was ample justification for the course which was taken, and that in interpreting your letter to mean that there was no disposition on the part of the Corporation to come to any amicable arrangement whatever in the matter, we were placing upon it the only construction it could reasonably bear." The Committee, on the other hand, append a foot-note to the letter referred to, as follows: "This letter was sent out from the Town Clerk's Office at 1 p.m. on the 28th of December. On the evening of the 29th a copy of the appointment of their Arbitrator and notice of the appointment was served on the Town Clerk—showing that the whole matter had been decided by the Gas Company previous to the receipt of the Town Clerk's letter of the 28th." The correspondence also dealt with the explosion which occurred at Coleham in 1898. The Town Clerk in December of that year wrote to the Manager of the gas-works (Mr. W. Belton) stating that the Main Drainage Engineers reported that the explosion was due to the infiltration of coal gas into the sewer through the brickwork of the man holes. To this Mr. Belton replied that the nature and attendant circumstances of the explosion were altogether opposed to those of a coal gas explosion; but even if coal gas was the agent, its presence arose from the result of sewerage operations. The Committee added that they had retained Mr. F. A. Bosanquet, Q.C., and Mr. A. Graham as Counsel for the Corporation; and that they were taking the steps necessary to resist the claim. The report was adopted.

ELECTRIC LIGHTING NOTES.

The Local Government Board have refused an application by the Morecambe District Council for a further loan of £24,000 for electric lighting, on the ground that they have already reached the limit of their borrowing powers.

The Corporation Electrical Engineer of Great Yarmouth reports that the number of applications received for electric current during the past five years has risen from 193 to 390, and the number of lamps connected with the mains from 5800 to 19,500.

The Ramsgate Corporation have decided to strenuously oppose a Bill that is being promoted by the Isle of Thanet Light Railways Company with a view of obtaining electric lighting powers in the borough. The Corporation have a scheme of their own, so that it is not likely they would consent to a rival project.

The Walsall Corporation electric lighting undertaking is not exactly speeding along the path of prosperity. Though it has been in existence four years, the last one was the first in which a profit was made; and it amounted to £61! In 1898, there was a loss of £279; and we suppose in the previous years there were deficiencies of even greater amount. If this is so, then there must be a nice little sum to wipe off the slate.

At the meeting of the Carlisle City Council last Tuesday, discussion took place regarding the charges for the electric light; numerous complaints having been made by householders and other consumers. A member remarked that the light had been treated too much like a new toy; and users had put in too many and too powerful lamps. Some of them had since reduced the number, and then said they could not see.

In prominent type, the Alliance and Dublin Consumers' Gas Company are advertising in the local newspapers a comparative statement of the cost of producing a light of 48-candle power for 1500 hours by electricity and gas. Of electricity, 270 units would be required, which, at 5d., would work out to £5 12s. 6d. With a No. 2 Welsbach burner, consuming 2 cubic feet of gas per hour, 3000 cubic feet would be needed, which, at 3s. 5d. per 1000 feet (Dublin price), would cost 10s. 3d. Thus a saving of £5 2s. 3d. is shown in favour of the latter system.

The Tiverton Town Council decided last week to engage the services of Mr. W. P. Adams, of London, to report upon a scheme for supplying electric light in the borough. The Borough Surveyor (Mr. J. Siddalls) has already reported generally upon the subject; and in the event of the scheme of Mr. Adams being adopted, Mr. Siddalls is to supervise the execution of the work, and generally act with the Consulting Engineer in the interests of the Council. Both are to be remunerated by commission on the outlay; Mr. Adams receiving 3 per cent., and Mr. Siddalls 2 per cent., on the cost.

Among the items of business "rushed" through at the end of Wednesday's meeting of the Liverpool City Council, was a recommendation of the Electric Power and Lighting Committee that the sum of £300,000 be voted for purposes connected with the supply of electrical energy. The resolution was disposed of without discussion. Alderman Paull, as the members were dispersing, entered a protest against the manner in which the matter had been disposed of. He said the Council had wrangled over a paltry sum of £250 for an hour, and yet a question of £300,000 was rushed through without comment. He thought this was a disgrace and a scandal.

Representatives of the District Councils of Lancashire last Tuesday conferred together at Manchester on the question of the attitude they should adopt towards the Lancashire Electric Power Bill. It was decided to organize a joint opposition to the measure; but the District Councils do not desire, as do the greater municipal bodies, its complete annihilation. The lesser authorities will be satisfied if they obtain protective clauses. Some of them have in view the making of a little money out of the venture by laying the electric mains in their own districts, and leasing them to the Company. Others, again, think the Company's service will be beneficial in districts that cannot afford a supply of their own; and only a few seem to prefer the complete rejection of the Bill.

The Bath Corporation have not thus far found their electric light undertaking to be a financial success; and at the next meeting of the Council the Committee will ask that £1937—nearly equivalent to a 2d. rate—shall be provided from the public funds to pay off the deficit which has accrued since the works were purchased from the Company three years ago. The accounts for 1899, just out, show that there was a gross profit, when working expenses only are considered, of £2165; but adding interest and repayment charges, and bringing forward last year's adverse balance of £125, this is converted into a deficit of £1937. "It is generally conceded, however," says a local paper, "that the lighting has not yet had a fair trial;" but on this subject, opinions may well differ.

Revised estimates for an electric lighting installation at Chesterfield were submitted at the meeting of the Town Council last Tuesday. They totalled to £25,000; and the Electrical Energy Committee advised that the Council should apply for the necessary sanction to a loan of that amount. A little discussion was raised on a remark by Mr. Robinson, in moving the adoption of the minutes, that the Engineer of the Westinghouse Company was of opinion that "it would be better to use steam rather than gas-engines" for generating the electricity. Alderman Clayton was averse to being bound down to act on the opinion of

a gentleman who was interested in the supply of a particular kind of machinery; and he advocated the employment of an independent expert. Personally, he believed gas could be used as cheaply as steam. He was supported by Mr. Locke; and Mr. Markham considered that, seeing the Corporation owned the gas-works, they should employ gas-engines. However, the Electrical Committee succeeded in persuading the Council to adopt their minutes.

At the meeting of the Halifax Town Council on the 8th inst., the Gas and Electricity Committee submitted the following report, which they had adopted, of the Engines and Boilers Sub-Committee: "That a bonus be given to the following staff of the electricity works on the total works and management costs when these are brought below 1·5d. per unit. The total cost per unit last year was 1·65d. It is proposed that for every 1-10th of a penny (and *pro ratâ* for every 1-100th of a penny) a bonus of £130 be given to the staff in the following proportions: To the Chief Engineer, £50; to the Assistant-Engineer, £40; to each Charge Engineer (at present three), £10; to each driver (at present four), £2 10s.—total, £130. The scheme to be in operation for the two years ending March 31, 1901, after which it shall be subject to revision. The bonus to be paid on each 30th of June. The bonus to be available for a total cost of 1·1d. per unit, but not lower. The stations having lowest total costs in England are as follows: Edinburgh, 1·21d.; Nottingham, 1·36d.; Chester, 1·38d.; Bradford, 1·43d.; Southport, 1·45d.; Leeds, 1·5d.; Manchester, 1·53d.; Sheffield, 1·55d.; Whitehaven, 1·6d.; and Halifax, 1·65d. Assuming our output to be 1½ million units, every 1-10th of a penny per unit on costs saved means a saving to the Corporation of £625. Under this scheme, the staff receive £130 out of the £625." The scheme was, however, withdrawn from the minutes on the latter being laid before the Council.

At last Wednesday's meeting of the Sheffield City Council, the annual report of the Electric Light Committee was presented. It made an interesting statement in reference to the accounts of the undertaking for the year 1899. The total revenue from all sources was £23,342, against £19,038 in 1898. The cost of production for 1899 was £9021, against £6334 for the previous year. The gross profit was £14,321, against £12,703. There had been paid for interest on loans during 1899 £9409; and for the sinking fund contribution £3996—leaving a net profit for the year of £914. At the commencement of the year they had left from the previous year's account £1330 of profit; so that they had now a free surplus amounting to £2244. The current sold during 1899 showed an increase of 35·9 per cent.; and the number of lamps had increased by 34·8 per cent. Having regard to the gloomy forecasts made in the Council Chamber a few weeks ago, the Chairman of the Committee thought he "might fairly speak of the result of the year's work as very satisfactory." The minutes were approved without discussion. A local paper referring to this matter said: "There were grave forecasts of immediate loss on the working of this municipalized industry; and the citizens were warned that they must expect to only gradually realize the advantages of the purchase, because the price had been high. The City had to buy its way into the business, and at once lay down capital for its expansion. Imputations had been made that before the purchase the concern had been inflated for sale. . . . The report is another triumph for the policy of municipalization which many of us have pushed with the earnestness of a fully-assured faith." It is full early to speak thus confidently.

The Leicester Town Council having applied to the Local Government Board for power to borrow £100,000 for electric lighting purposes, an inquiry into the matter was held last Wednesday by Colonel H. F. Turner, R.E. The Town Clerk (Mr. J. Bell) said the capital already raised with the sanction of the Local Government Board for works and plant for the supply of electricity amounted to £76,293, or £78,207 including the expenses of the issue of the stock. The profit of the undertaking since the supply commenced in December, 1894, to June last, had been £6488; and after £6830 had been charged to the sinking fund, the amount of net loss up to June was £342, which would no doubt be met by the profit from the working of the past half year, the accounts of which had not been published. In the first complete year of working, the total output in units was 123,480; and in the year ending December last it had risen to 780,270 units. The capacity of the present central station was equal to 1400 kilowatts, or, allowing for a spare machine, 1050 kilowatts, with a total boiler capacity somewhat short of that. The maximum demand for electricity during the half year ended December, 1899, reached 880 kilowatts; leaving a margin of 170 kilowatts only. The receipts for current increased from £3320 for the half year ended December, 1897, to £4765 for the similar period ending December, 1898. The Gas and Electrical Engineer (Mr. Alfred Colson) gave a detailed estimate of the cost of the works he recommends to be carried out, amounting to £86,268, which, together with £13,732 overspent on the original estimate, made up the total of £100,000 the Council asked for authority to borrow. He also furnished particulars of the growth of electric lighting in Leicester, and said the increase in motors from December, 1897, to December, 1899, was from 344 to 632; in the lamps installed, from 27,578 to 52,526; and in the total output, from 204,084 to 437,943 units. Since the 1897 inquiry, the demand had more than doubled; and since the reduction in price from 5d. to 4d. per unit in June last, 31 motors had been fixed. The desire for current was never so great as it was at the present time. There were being wired 37 premises, representing 3500 lamps; and, in addition, there were a large number of other premises which would be wired before next autumn. He had recommended a considerable extension of the central station, which, when completed, would contain four additional alternators of 1000 kilowatts each. To meet the immediate probable requirements, he had advised the erection of two of these machines and five boilers, together with the necessary auxiliary apparatus; bringing the capacity of the station up to 3400 kilowatts. He estimated at £86,268 the total cost of the work proposed. No electric lighting undertaking in the country occupied a more enviable position than that of Leicester with regard to capital outlay. The results were pre-eminently satisfactory; and experts said that the Leicester works were the most scientific and up-to-date in the country. The capital expenditure did not exceed £55 per kilowatt, and the cost would be considerably less with the new works. Up to June, 1899, the loss was £342, and the profit in the past half year was £1089; leaving a net gain of £747.

Reduction in Price.—The Directors of the Hoddesdon Gas Company have reduced the price of gas by 2d. per 1000 cubic feet from the 1st ult.

GAS AND WATER COMPANIES' STOCK AND SHARE LIST.

Referred to on p. 460.

Issue.	Share.	When ex-Dividend.	Dividend or Dividend & Bonus.	NAME.	Closing Prices.	Rise or Fall in Wk.	Yield upon Investment.
£			p. c.	GAS COMPANIES.			£ s. d.
590,000	10	Oct. 13	10½	Alliance & Dublin 10 p. c.	20½—21½	..	4 17 8
100,000	10	,,	7½	Do. 7 p. c.	14—15	..	5 0 0
800,000	100	Jan. 2	5	Australian 5 p. c. Deb. .	100—102	..	4 18 0
200,000	5	Nov. 15	6	Bombay, Ltd. . . .	5¾—6½	..	4 8 11
40,000	5	,,	6	Do. New, £4 paid .	4—4½	..	5 6 8
380,000	Stk.	Aug. 16	12	Brentford Consolidated	273—278	−2	4 6 4
270,000	,,	,,	9	Do. New . . .	208—213	−2	4 4 6
50,000	,,	,,	5	Do. 5 p. c. Pref. .	140—145	..	3 9 0
159,375	,,	Dec. 14	4	Do. 4 p. c. Deb. .	124—128	..	3 2 6
220,000	Stk.	Sept. 15	11½	Brighton & Hove Orig. .	255—260	..	4 8 6
226,320	,,	,,	8½	Do. A. Ord. Stk. .	185—190	..	4 9 6
973,500	Stk.	Aug. 16	5	Bristol, 5 p. c. max. .	125—130	..	3 16 11
420,000	20	Sept. 29	10	British	43—44	−½	4 10 11
50,000	10	Aug. 31	12	Bromley, Ord. 10 p. c. .	25—27	..	4 8 11
75,000	10	,,	9	Do. 7 p. c. . . .	19—21	..	4 5 8
500,000	10	Oct. 13	6	Buenos Ayres (New) Ltd.	9¾—10¼	..	5 17 1
220,000	Stk.	Dec. 29	4	Do. 4 p. c. Deb. .	98—100	..	4 0 0
150,000	20	July 13	8½	Cagliari, Ltd. . . .	28—29	..	5 13 10
100,000	10	Sept. 29	8	Cape Town & Dis., Ltd.	13½—14½	..	5 10 4
50,000	50	Nov. 2	6	Do. 6 p.c. 1st Mort.	56—58	..	5 3 5
550,000	Stk.	Oct. 13	13½	Commercial Old Stock .	305—310	..	4 7 1
200,750	,,	,,	10½	Do. New do. .	240—245	..	4 5 9
200,750	,,	Dec. 14	4½	Do. 4½ p. c. Deb. .	140—145	..	3 2 1
800,000	Stk.	Dec. 14	9	Continental Union, Ltd.	177—181	..	4 19 5
200,000	,,	,,	7	Do. 7 p. c. Pref. .	178—183	..	3 16 6
51,600	Stk	Aug. 31	14	Croydon A 10 p. c. . .	335—340	..	4 2 4
168,400	,,	,,	11	Do. B 7 p. c. . .	265—270	..	4 1 5
555,000	Stk.	Aug. 16	5½	Crystal Palace Ord. 5 p. c.	125—130	..	4 0 9
60,000	,,	,,	5	Do. 5 p. c. Pref. .	140—145	..	3 9 0
486,090	10	Jan. 26	11	European, Ltd. . . .	20½—21½	..	5 2 4
354,060	10	,,	11	Do. £7 10s. paid .	15—16	..	5 3 2
14,993,075	Stk.	Feb. 9	4⅘	Gas-light and Coke	4 p. c. Ord. . .	105—107	−1	4 13 5
2,600,000	,,	,,	3½		3½ p. c. max. .	95—98*	..	3 11 5
3,799,735	,,	,,	4		4 p. c. Con. Pref.	119—122*	..	3 5 7
3,993,975	,,	Dec. 14	3		3 p. c. Con. Deb.	98—100	..	3 0 0
70,000	10	Nov. 15	8	Hongkong & China, Ltd.		13¼—14½	..	5 10 4
3,800,000	Stk.	Nov. 15	10	Imperial Continental .		215—220	..	4 10 11
473,600	Stk.	Feb. 9	3½	Do. 3½ p. c. Deb. Red,		100—103*	..	3 8 0
75,000	5	Dec. 14	6	Malta & Medn., Ltd. .		4½—5½	−½	5 9 1
560,000	100	Oct. 2	5	Met. of Melbourne	5 p. c. Deb.	110—114	..	4 7 9
250,000	100	,,	4½		4½ p. c. Deb.	107—109	..	4 2 7
541,920	20	Nov. 15	3	Monte Video, Ltd. . .		11—12	..	5 0 0
617,946	Stk.	Aug. 31	9½	Newc'tle & Gatesh'd Con.		220—225	..	4 2 3
264,855	Stk.	Dec. 29	3½	Do. 3½ p. c. Deb. .		104—107	..	3 5 5
60,000	5	Sept. 29	7	Ottoman, Ltd. . . .		5—5½	..	6 12 7

* Ex div.

Issue.	Share.	When ex-Dividend.	Dividend or Dividend & Bonus.	NAME.	Closing Prices.	Rise or Fall in Wk.	Yield upon Investment.
£			p. c.	GAS COMPANIES.			£ s. d.
150,000	5	Nov. 30	8	Oriental, Ltd. . . .	7—7½	..	5 6 8
135,000	5	,,	8	Do. New, £4 10s. pd.	6¼—6⅝	..	5 6 8
15,000	5	,,	8	Do. do. 1879, £1 pd.	1¼—1⅜	..	4 11 5
500,000	100	Dec. 1	6	People's Gas of Chicago	2nd Mtg. Bonds .	102—106	..	5 13 2
851,070	10	Oct. 13	7	River Plate Ord. . . .		10¾—11¼	..	6 4 5
250,000	Stk.	Dec. 29	4	Do. 4 p. c. Deb. .		99—101	..	3 19 3
250,000	10	Sept. 15	10	San Paulo, Ltd. . . .		12—13	..	7 13 10
135,000	Stk.	Sept. 15	10	Sheffield A.		249—251	..	3 19 8
209,053	,,	,,	10	Do. B.		249—251	..	3 19 8
447,427	,,	,,	10	Do. C.		249—251	..	3 19 8
5,600,000	Stk.	Aug. 16	5½	South Metrop., 4 p.c. Cri.		133—136	..	3 18 5
1,520,000	,,	Jan. 12	3	Do. 3 p. c. Deb. . .		100—102	..	2 18 10
120,000	Stk.	Aug. 31	6	Tottenham and Edmonton	A. 5 p.c. B. 3½ p.c. 4 p.c. Deb.	141—143	..	4 3 11
250,520	,,	,,	4½			102—104	..	4 6 6
55,100	,,	Dec. 14	4			113—117	..	3 8 5
182,380	10	Jan. 12	5	Tuscan, Ltd.		8¾—9½	..	5 5 3
149,900	10	Jan. 2	5	Do. 5 p. c. Deb. Red.		101—104	..	4 13 2
				WATER COMPANIES.			
780,399	Stk.	Dec. 29	11	Chelsea, Ord.		307—312	..	3 10 6
150,000	,,	,,	5	Do. 5 p. c. Pref. .		157—162	..	3 1 9
160,000	,,	,,	4½	Do. 4½ p. c. Pref. '75		145—150	..	3 0 0
175,785	,,	Sept. 29	4½	Do. 4½ p. c. Deb. .		148—153	..	2 18 10
1,720,560	Stk.	Oct. 13	7	East London, Ord. . .		203—208	+2	3 7 4
654,740	,,	Dec. 29	4½	Do. 4½ p. c. Deb. .		145—150	..	3 0 0
390,000	,,	,,	3	Do. 3 p. c. Deb. .		98—100	..	3 0 0
700,000	50	Dec. 14	7½	Grand Junction	10 p. c. max. .	108—110	+1	3 8 2
310,000	Stk.	Sept. 29	4		4 p. c. Deb. .	131—136	..	2 18 10
708,000	Stk.	Aug. 16	14	Kent		345—350	−3	4 0 0
160,000	,,	,,	7	Do. New, 7 p. c. max. .		200—210	..	3 6 8
1,043,800	100	Dec. 29	10½	Lambeth, 10 p. c. max. .		295—300	..	3 10 0
406,200	100	,,	8	Do. 7½ p. c. max. .		215—220	..	3 12 9
350,000	Stk.	Sept. 29	4	Do. 4 p. c. Deb. .		135—138	..	2 18 0
500,000	100	Aug. 16	13½	New River, New Shares		425—430	..	3 3 1
1,000,000	Stk.	Jan. 26	4	Do. 4 p. c. Deb. .		130—135	..	2 19 3
902,300	Stk.	Dec. 14	7½	South-wark and Vauxhall	Ord. . . .	200—205	..	3 13 2
126,500	100	,,	7½		7½ p. c. max.,	190—195	..	3 16 11
489,200	Stk.	,,	5		5 p. c. Pref.	160—165	..	3 0 7
1,019,585	,,	Oct. 13	4		4 p. c. A Deb.	131—136	..	2 18 10
1,155,066	Stk.	Dec. 14	10	West Middlesex . . .		290—295	+2	3 7 10
200,000	,,	,,	4½	Do. 4½ p. c. Deb. .		147—152	..	2 19 3
200,000	,,	Sept. 15	3	Do. 3 p. c. Deb. .		100—102	..	2 18 10

*Ex div.

NOTES FROM SCOTLAND.

From Our Own Correspondent.

Saturday.

The Corporation of Glasgow have taken prompt action in dealing with one of the firms contracting to supply them with coal, who for the past three months have been short in their deliveries. The contractors in question are Messrs. John Watson, Limited, who hold a contract for 50,000 tons of coal. The Town Clerk has been instructed to intimate that, on account of the non-delivery, the Corporation will exercise the option conferred upon them by the agreement of purchasing coal in the open market, as against the short deliveries, and will charge the difference in price against the contractors. The remedy is quite a feasible one; but it is one which is very difficult to enforce.

The proposal to form a Friendly Society for gas workers in the employment of the Glasgow Corporation was discussed in a meeting of the Town Council on Thursday. Mr. R. M. Mitchell, the Convener of the Gas Committee, who has now returned to his post after being absent for some time on account of his health, moved the approval of the recommendation of the Committee. Mr. Cronin, one of the labour men in the Council, thought that the proposal was a one-sided one, and that the Committee should re-consider it. Mr. Shaw Maxwell, another labour member and co-operator, supported this view. Both gentlemen declared that they were not opposed to the formation of a Friendly Society, but they wished more information. There was some confusion of ideas as to whether they should approve of a scheme first, or should get parliamentary powers to contribute to a scheme, and after that consider whether or not they would go on. It was pointed out that the Corporation could not go to Parliament asking powers without having first agreed to the formation of a scheme; and that the details could be considered afterwards. The recommendation of the Committee was adopted by 50 votes to 10.

A movement has been set on foot for the transfer of the undertaking of the Galashiels Gas Company to the Corporation. This is not the first time that the proposal has been made; and it is just probable that on the present occasion the matter will make no more progress than it has done before. The Corporation on Monday agreed unanimously to remit the matter to a Committee to make inquiries as to the terms upon which the Corporation could acquire the undertaking. The only doubt which was expressed as to the expediency of a transfer went no further than a suggestion that they might probably require to first adopt the Burghs Gas Supply Act of 1876; but Provost Dun said this question would be included in the remit, which was then agreed to. It was spoken of as being a profitable transaction to the town, now when money is cheaper than it once was, if a reasonable price could be secured. It is upon this matter of reasonable price that the parties are likely, if they ever get into negotiation, to hopelessly differ. The cheapness of money will have the effect of raising the amount of the price. Then the price of gas being only 3s. 4d. per 1000 cubic feet also enhances the value of the undertaking. But when the low price of gas is considered, it is difficult to think of any reason why a transfer should be sought by the Corporation or entertained by the Company, unless for academic reasons. Of course, the great success which has attended the transfer in the neighbouring town of Peebles, may be an incentive; and the Corporation of Galashiels may be convinced that they have, in their town, an unoccupied field as lucrative as that which the Corporation of Peebles have found to their hand, and have developed with so much benefit to themselves. Inquiry may bring this out; and if it does, no harm will be done.

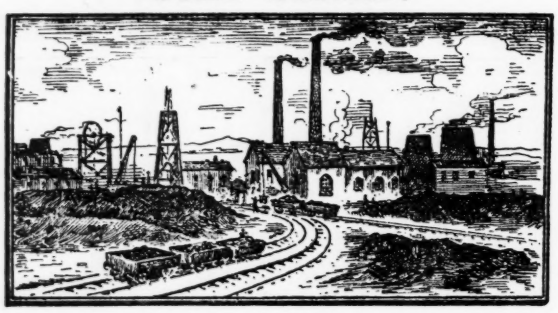
The Falkirk Gas Commissioners have, like many others, had difficulty in procuring coal during this winter. It was agreed that the Convener of the Works Committee and the Manager (Mr. J. Kincaid) should look out in the open market for 500 or 600 tons of splint coal. They have been successful, as it was reported to the Commissioners on Monday that they have obtained 300 tons of splint. The terms are not given; but the price, except to the Falkirk Commissioners, is not the most interesting feature of the transaction—it is that, notwithstanding asseverations as to the scarcity of coal, such coal can be had. This leads to the reflection that, granted the industrial world is busy, and the demand for coal great, this does not really explain the state of the coal market.

The Falkirk Commissioners had before them on Monday a report on borings which had been made for the purpose of ascertaining whether the ground at the place where the new gasholder stands would be suitable for the erection of gas-works. One adviser of the Commissioners had said it would be, and another had said, more emphatically, that it would not. The latter seems to have carried the day; for, on the joint recommendation of the Works and Finance Committees, it was unanimously resolved by the Commissioners to proceed with the Gas Bill now before Parliament. Two other sites are mentioned in the Bill; and it is evident from this week's resolution that one or other of them will be adopted.

Another subject which the Commissioners had before them was as to the publication of the illuminating power of the gas. The Burgh Police (Scotland) Act, 1892, requires that where gas is supplied by the burgh commissioners, it shall be tested by a person to be appointed by the Sheriff; and the Commissioners are required "to publish the results at least once a month." This is a very loosely-drawn provision. For instance, it is not required that the tests shall be monthly; and therefore two tests—although taken, say, on Jan. 1—might be published monthly during the remainder of the year, and the statute would be complied with. But, granting that it is the results of monthly tests which is meant, there is no direction as to where publication is to be made. Some members of the Commission hold that it means advertisement; others that it means handing the figures to the Press representatives, for publication as news. The matter was left with the Clerk. I should say that neither of the contentions is correct. Publication is merely making public, which can be done by reading over the figures at a public meeting; and the Press may make use of them or not. If the Act of Parliament had meant advertisement, it would have specified some description of publication.

Mr. Hubert Pooley, Gas Engineer to the Corporation of Dunfermline, has an excellent practice of once a year submitting a report to the Commissioners on the condition of the works and plant. In his latest report, Mr. Pooley says that the ordinary repairs this year will include repairs

COAL SCARCE.



There is a tide in the affairs of men (and Gas Departments), which, taken at the flood, leads on to fortune.
Julius Cæsar IV., 3.

STOVES PLENTIFUL.

to retort-bench £220, painting of ironwork, &c., £90, and repairs to fittings and to foreman's house £45. The whole of the carbonizing plant was in use for a short time during the past winter; and, although the price of materials and labour had gone up since his last report, the Commissioners should now consider the best means of increasing their producing power. The possible results of a curtailed supply of gas during the winter months might be very serious. The present margin of producing power was only about 7 per cent., estimated on the maximum day's manufacture of the past season. At the present time, the approximate cost of extending the retort-bench, and of providing a smithy and store, would be about £3150. The condensers and scrubber were both being fully employed at the end of December; and these should also be extended at an early date. The purifiers, meters, governors, and gasholders were all sufficient for some years to come. No. 1 gasholder was not showing any signs of increased corrosion at the water-lute; and the measures taken last year with this end in view appeared to have been quite successful. In January, 1898, Mr. Pooley pointed out that there were a number of mains which were quite inadequate; and a comparatively small number of these only had been relaid. However, he thought it was advisable to postpone the relaying of the pipes to a more favourable opportunity. The sulphate plant authorized last year is being erected at the present time. The report goes to a Committee for consideration. In the course of their meeting on Monday, arrangements were made for the holding of an exhibition of gas appliances; the exhibitors being the Northern Syndicate.

I am glad to learn, through an independent channel, that friendly relations have begun to be manifested between the Corporation of Stirling and the Stirling Gas Company. The information is confirmed by the fact that the Corporation this week sanctioned the use, free of charge, by the Gas Company, of a few lamps in the burgh for a trial of incandescent gas lighting; and a remit was made to have the positions of the lamps fixed. The Corporation are about to inaugurate an installation of electricity; and this is doubtless an endeavour by the Gas Company to show that they can compete with electricity in the matter of lighting. The fact that the Corporation are willing to give them the opportunity, is what is worth noting. The Gas Company should have their eye on the new railway station which is being erected. It would be a pity to allow the lighting of it to pass into the hands of the electricians, when the Gas Company could do it so much better and cheaper.

Johnstone is one of the smaller burghs in Scotland where the consumption of gas has increased greatly of late. During the past five years, the increase has been from 26 to 38 million cubic feet. Extension of the works has consequently become a necessity. The Commissioners have consulted Mr. J. M'Gilchrist, of Dumbarton, on the subject; and on Monday the plans which he had prepared for the proposed extension were submitted. These will involve an outlay of about £9000. The Commissioners authorized Mr. M'Gilchrist to issue schedules for the preparation of tenders for the work, and also to approach the Glasgow and South-Western Railway Company with a view to securing a railway siding into the gas-works.

Mr. A. Wilson, Gas Engineer, of Perth, brought under the notice of the Works Committee of the Gas Commissioners the fact that he had experienced great difficulty on several occasions, owing to the non-delivery of coal contracted for, and that he had, in consequence, ordered coal from various companies. The Works Committee approved of his action; and on his recommendation it has been resolved to invite offers for 3000 tons of a good splint or gas coal.

His Excellency the Chinese Ambassador in London paid a visit to Glasgow this week. On Wednesday, he was shown over the engineering works of Messrs. Sir William Arrol and Co., at Dalmarnock. He is reported to have displayed considerable interest in gas-works plant which the Company have constructed, or have under construction. Is there here a foreshadowing of the opening up of China to gas supply? He displayed, it is added, an unconcealed delight in the many ingenious machines he was shown. Among these was a large installation of gas-works plant which is going to Turin. When he saw a drawing-machine at work, he gave utterance to a prolonged "Ah!" of admiration. It was explained to him by Mr. Biggart, the Managing-Director of the Company, that the coal-waggon is tipped, the retorts charged and drawn, and the coke loaded into waggons and drawn out, without being touched by human hands. The Ambassador was much impressed, and remarked: "Here machinery is man's slave." The expression is a happy one, and will live in the memories of those who provide industrial appliances. The reflection it calls up is that had it not been for the attempt by workmen to enslave their employers, the machine would, in all probability, not have been evolved.

Mr. Henry Johnston, Q.C., the Sheriff of Forfarshire, is a gentleman whom I have spoken of before as having a habit of letting it be known that he is the master, and will do his work in his own way. He did so in the matter of the extension of the boundaries of Broughty Ferry; and he has done so again in the matter of the appointment of Auditors for the public accounts of the burgh of Forfar. The Gas Corporation of the burgh asked his Lordship to appoint Mr. Andrew Bennie; and the Police and Water Departments of the Corporation wished the appointment of Mr. S. J. M'Lees for their accounts. The Sheriff has disregarded the requests, and has appointed Mr. A. Mackay, of Dundee, to be Auditor of all the burgh accounts. In a note which he has written to his interlocutor making the appointment, he says, with some apparent heat, that he thought he had expressed himself with sufficient clearness in dealing with a similar application from the burgh of Montrose last year, to remind the members of corporations in the other burghs of their and his relative positions in the matter of the appointment of an auditor. He regretted to find that the terms in which he then expressed himself had either not reached the burgh of Forfar, or had failed to penetrate into the minds of the town councillors of the burgh. He should have thought that the situation was not capable of misapprehension. But he found it necessary to state as clearly as he could that, in making the appointment of a burgh auditor, he was responsible to the ratepayers; that the duty was committed to him as Sheriff because he was assumed to be independent of local interests and local politics; and that in the performance of this duty he should accept no suggestions from the members of the Corporation. Alluding to the utter inadequacy of the remuneration, his Lordship said

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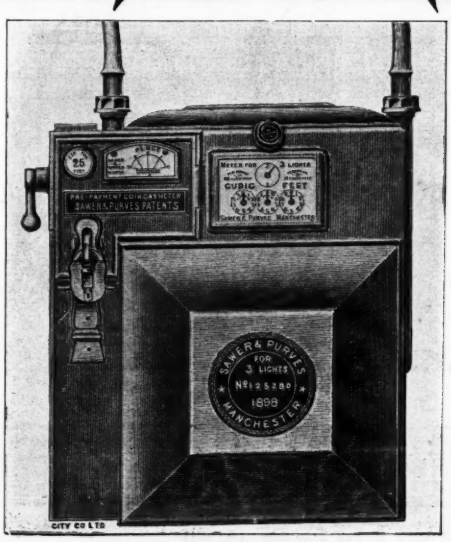
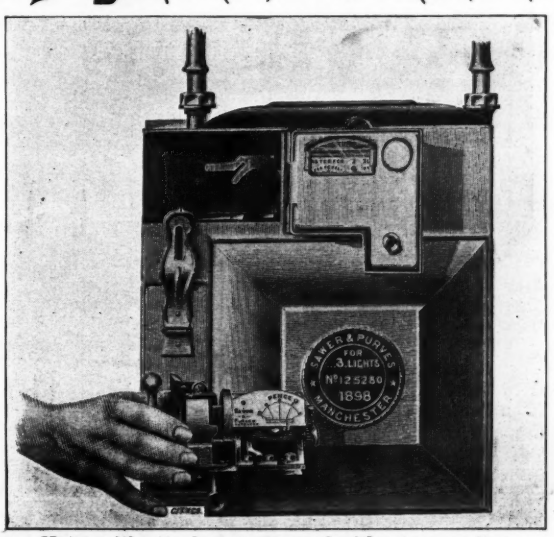


Meter in working position.



Meter with attachment removed without uncoupling.

he had no doubt the Commissioners had obtained an audit more than the equivalent of their fees (£6 10s.); but he was convinced they had not secured the kind of audit which the statute intended, and to which the ratepayers and consumers were entitled. It was no disparagement to the local auditors that he declined to accept the suggestion as to their appointment, but because he esteemed it his duty to break down the idea that the members of the Corporation had any say whatever in the selection of the auditor, upon whose independent service the ratepayers and consumers were entitled to rely.

The annual report of Mr. J. M. Gale, the Engineer to the Glasgow Corporation Water Department, states that during 1899 the quantity of water sent into the city averaged 49,627,523 gallons from the Loch Katrine works, and 4,955,328 gallons from the Gorbals works—making a daily average of 54,582,851 gallons. During 1898, the daily average was 52,634,665 gallons, or 1,948,186 gallons less than during 1899. Mr. Gale also reports that the new works at Loch Katrine are making good progress. Arrangements have been made for raising the level of the loch 18 inches above its former top-water level this month, in order to provide against another dry summer such as we had in 1899. During the past year, 96 new hydraulic machines have been supplied with water, making a total of 393 machines in use. There are 38 applications on hand. In 1898, the hydraulic supply was 59,977 gallons daily. Last year it was 85,943 gallons.

CURRENT SALES OF GAS PRODUCTS.

LIVERPOOL, *Feb.* 17.

Sulphate of Ammonia.—The market has been quiet; and values have barely been maintained, but quotations remain at £11 17s. 6d. to £12 per ton, delivered f.o.b. at the ports. There has been no pressure on the part of makers to sell; but, on the other hand, buyers have for the most part refrained from purchasing in the absence of orders from abroad. Hence business actually done has been only on a limited scale. In the forward position, important business has been reported; the quotations remaining at £12 per ton, Beckton terms, and ordinary terms, f.o.b. Leith.

Nitrate of Soda keeps firm at 8s. 9d. per cwt. for fine quality on spot, and 9s. for March delivery.

LONDON, *Feb.* 17.

Tar Products.—Benzols continue flat; and, although they are more readily saleable, the tendency is rather to lower than higher prices. Large quantities are being taken up for gas enrichment purposes, which relieves the position considerably; and if this goes on, the increasing quantities that are said to be coming on the market may not be so injurious to values as has been anticipated. The unexpected fall in the price of alizarine does not present a hopeful prospect for anthracene. Anthracene, however, is well held, and in decreasing production; and its present price cannot possibly go lower. Solvent and other naphthas for export are weaker than their quoted value in certain industrial centres; but a prohibitory high rate of carriage prevents manufacturers in other parts participating in these markets. Tar oils are in good request at former rates.

Business during the week has been marked at: Tar, 17s. to 26s. Pitch, east coast, 35s. 6d.; west coast, 33s. 6d. Benzol 90's ordinary, 7d.; special qualities for gas, 8½d.; 50's, 9d. Toluol, 90's, 1s. 2d.; pure, 2s. Solvent naphtha, 1s. 2d. Crude, 30 per cent, naphtha, 4½d. Heavy naphthas, 1s. 2d. Creosote, 3¼d. Heavy oils, 3¾d. Carbolic acid, 50's, 2s. 10d.; 60's, 3s. 3d. Crude naphthalene, 55s. Anthracene, nominal, "A," 4d.; "B," 2½d.

Sulphate of Ammonia has kept steady during the whole of the week. Sellers are firm, stocks are low, and the demand is unusually good. £11 17s. 6d., less 3½ per cent. at all ports, is about to-day's figure. For forward delivery, makers are asking 5s. to 10s. more; and it is not unlikely that this advance may be realized for the spring months.

COAL TRADE REPORTS.

From Our Own Correspondents.

Lancashire Coal Trade.—During the past week there has been a further upward move in prices, brought about by the continued exceptional pressure for all descriptions of fuel, and the special conditions connected with the recent spell of very severe weather. The principal colliery firms in the Manchester district, who last month only partially followed the upward move in other portions of Lancashire, on Thursday further advanced their prices 10d. per ton where they had previously been put up 10d., and 5d. where they had been raised 1s. 3d.—making an all-round advance of 1s. 8d. per ton. List rates in other Lancashire districts remain without actually quoted change; but supplies of both round coal and engine fuel continue so short that in the open market all sorts of special prices are still being obtained. At the pit, list rates may be quoted about 14s. 6d. to 15s. 6d. per ton for best house-fire coals, 13s. to 14s. for medium, 12s. to 12s. 6d. for steam and forge coals, 9s. 6d. to 10s. for medium, and 10s. 6d. to 11s. for best slack. So far no official move has been made with regard to the prices that are to be quoted for the ensuing season's gas coal contracts. But the question is being very generally talked of in the market; and the prevailing opinion is that there will be an advance of at least 3s. to 4s. per ton upon the prices at which contracts were taken last year—representatives of many collieries adding that, considering the present condition of the coal trade, users of gas coal may consider themselves very fortunate if they get off with an advance which does not exceed the above amount. On any special quantities that have been required by gas companies recently beyond contracts, advances of 4s. have generally been quoted; and these have had to be paid to ensure their requirements being covered. If anything, the pressure in the shipping trade increases; while supplies are certainly no more plentiful, but perhaps even shorter than they have been. The result is that, where cargoes are absolutely needed for prompt shipment, exceptional figures have to be paid; and the general basis of prices is quite as high as 15s. 6d. to 16s. per ton for ordinary steam coal, to 17s. and 17s. 6d. for the better qualities, delivered at the ports on the Mersey.

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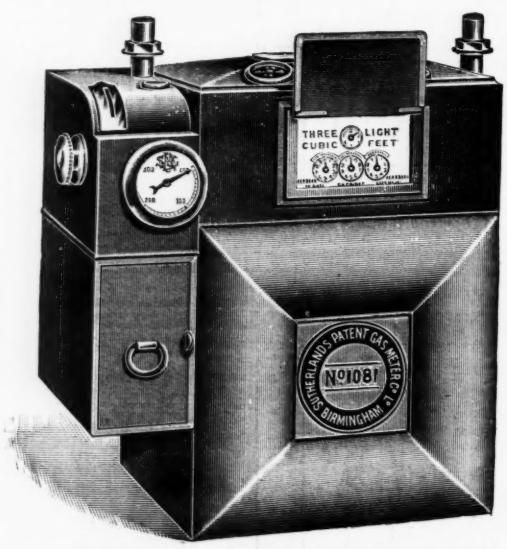

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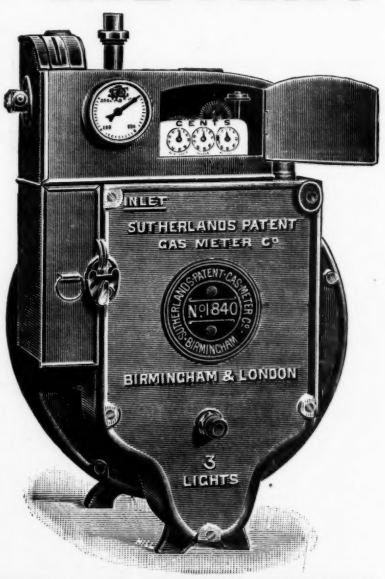

THE SUTHERLAND GAS-METER COMPANY
ESSEX WORKS, BIRMINGHAM.

For all descriptions of coke there is a continued very pressing demand, and most of the manufacturers are a good deal behind-hand with deliveries. For gas coke, prices continue to tend upwards; and during the past week there has been a further advance—bringing quotations at the works in the Manchester district to 15s. and 15s. 10d. per ton.

Northern Coal Trade.—Though there has been, through a severe snowstorm, some disorganization of the coal trade, the demand has been full, and there are heavy orders in course of negotiation. Prices show now the influence of contracts which have in degree defined the rates likely to be paid both for steam and gas coals. In two contracts, the supply of gas coal for Stockholm has now been settled; the quantity being about 84,000 tons for the season, and the price about 20s. 6d. to 20s. 9d. c.i.f. at Stockholm. The exact price thus left for the coal, f.o.b., depends on the amount allowed for the freight; but taking an average freight, the coal price f.o.b. might be put at perhaps 14s. per ton—a very substantial increase on the prices for the same contracts last year. Such a result will help to decide rates for the large gas coal contracts that are approaching. In the meantime, other export gas coal contracts are nearing conclusion. The steam coal trade is stiffened by some Governmental contracts that have been given out in the last few days. For best Northumbrian steam coals, the quotation for occasional cargoes is about 18s. per ton f.o.b., and for steam smalls 11s.

Scotch Coal Trade.—The market continues strong, with no change. Forward sales are common, at full current prices. The quotations are: Main 14s. 6d. to 15s. per ton f.o.b. Glasgow, ell 16s. to 16s. 9d., and splint 15s. 6d. to 16s. The shipments for the week amounted to 194,580 tons—a decrease of 13,171 tons upon the previous week, but an increase of 46,155 tons upon the corresponding week of last year. For the year to date, the total shipments have been 1,003,799 tons—an increase of 193,313 tons upon the same period of last year.

The Powers of the Massachusetts Gas Commissioners.—A correspondent writing from Boston to the "American Gaslight Journal" on the above subject, dealt with in the "JOURNAL" last week, says: "The recent decision of the Massachusetts Board of Gas and Electric Light Commissioners, recommending the reduction of price of gas in Haverhill to 80 c. per 1000 cubic feet on Feb. 1, bids fair to bring about a vast amount of agitation as to the proper price for gas in the various Massachusetts cities and towns, and is causing much uneasiness among gas officials and shareholders. . . . Already demands have been made for reductions in gas-rates in Boston, East Boston, Lowell, and other places. Several Bills are in the Legislature asking for reductions in the Boston gas-rate anywhere to and between 50 c. to 75 c. per 1000 cubic feet; and the Boston parties who, by such extensive advertising of a year or more ago, sowed the wind of 35 c. and 50 c. gas, will reap a whirlwind which is liable to blow their gas securities out of sight. It is not believed that the Haverhill Company will attempt the apparently impossible task set by the Commission, but will appeal to the Courts. In such an event, the matter of reduction may be indefinitely prolonged, in Haverhill and elsewhere."

Increase in the Price of Gas at Cape Town.—We learn by the last mail that the local Directors of the Cape Town Gas Company had received instructions from the London Board to raise the price of gas by 10d. per 1000 cubic feet from the 1st inst. This will bring the price up to 10s. per 1000 cubic feet. The causes of the increase are a rise in the price of coal, and the higher charges for freight as well as for the landing of coal at Cape Town.

Sale of Stocks and Shares.—At the Mart, Tokenhouse Yard, E.C., last Tuesday, Mr. Alfred Richards sold some fully-paid £10 "B" shares in the Eastbourne Gas Company, the last dividend on which was at the rate of 11½ per cent. per annum, at £24 10s. each. He also submitted for competition, by order of the Directors, a new issue of £7000 of "C" (5 per cent.) stock of the Ilford Gas Company; the last dividend on similar stock having been at the rate of 6 per cent. per annum. With the exception of one lot, which fetched £128, it was sold at prices ranging from £124 to £126 per £100 of stock, which may be regarded as a fairly satisfactory result.

New Pumping-Station for the Farnham Water-Works.—Last Tuesday, the new pumping-station which has been erected by the Farnham Water Company was formally opened. It contains two pumps of the Worthington type, each capable of delivering 192,000 gallons in twelve hours. The present consumption is about 150,000 gallons per day; but in summer it rises to 170,000 gallons. The new machinery was manufactured by the Coalbrookdale Company, Limited, to the design of Mr. J. White Lewis, the Engineer and Manager of the Water Company, who superintended the whole of the work in connection with the building of the new station, the well at which has been made 8 feet in diameter and 30 feet deep.

Manchester Water Supply.—At a meeting of the Water Committee of the Manchester City Council held last Thursday, it was reported that the laying of the new 15-inch main from Irlams-o'-th'-Height to Eccles was completed on the 10th inst. It is expected to prove most beneficial to the district concerned. Hitherto Thirlmere water has been conveyed from the Prestwich reservoir by means of a 24-inch main to Pendlebury, and from Irlams it has passed to Eccles along only a 7-inch pipe. This small main will continue in use, and the addition to it of the 15-inch pipe will raise the pressure at Eccles by 35 lbs.; bringing it up to 60 lbs. or 65 lbs. per square inch. The scheme for securing the storm water from Longdendale by a 40-inch pipe two miles long to the Godley Tunnel, which was recently approved by the Council, once more came before the Committee. It was mentioned that tenders had been invited for the supply of 2385 tons of pipes of the dimensions indicated. These will cost £15,000 to £16,000. The whole work is estimated to require about £25,000, and will be carried out by the Committee's Engineer (Mr. G. H. Hill) and servants. It is being seriously considered by the Committee that speedy steps should be taken towards commencing to lay the second pipe from Thirlmere in those parts of the route where the greatest difficulties will be met with, and the longest time required for the operation. Mr. Hill has been requested to prepare a special report upon this subject for an early meeting.

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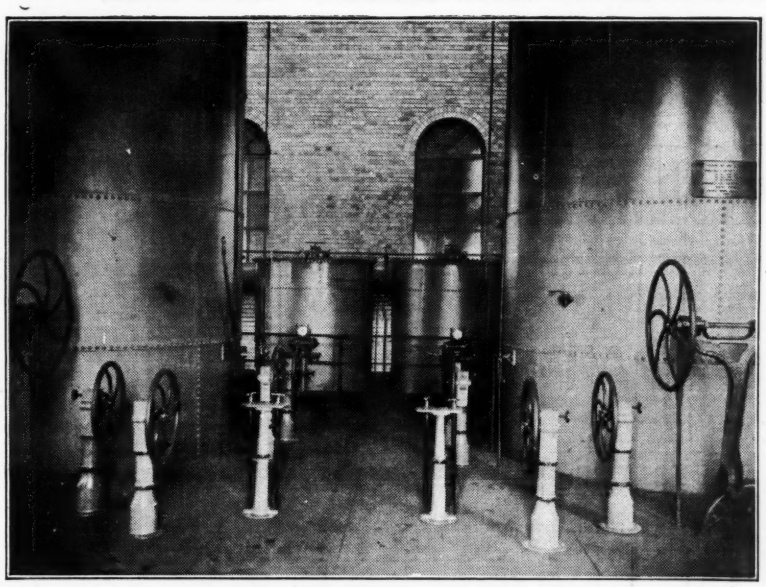

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Price of Gas for Power Purposes at Widnes.—It was announced by the Gas and Water Committee at last Tuesday's meeting of the Widnes Town Council, that they had resolved, subject to the approval of the Council, to reduce the price of gas for motive power from 1s. 5d. to 1s. 3d. per 1000 cubic feet, less 2d. per 1000 feet discount. The minute was approved.

The Horbury District Council and the Ossett Gas Bills.—At a public meeting of the ratepayers at Horbury recently held, it was resolved to oppose the Bill promoted by the Ossett Gas Company to obtain an extension of powers and authority to sell their undertaking to the Ossett Corporation, and also the Bill to enable the latter body to purchase, although the Council are willing to assist them in obtaining possession of the gas-works. The opposition, in their case, is only to safeguard the interests of Horbury.

Public Lighting Curtailed Through Shortness of Gas Coal at Walsall.—At the last meeting of the Walsall Town Council, the Gas Committee reported that, owing to the difficulty of obtaining a sufficient supply of gas coal, they had deemed it expedient to reduce the number of public lamps lighted for a few weeks; but as the deliveries were now improving, the Engineer and Manager (Mr. W. Gorse) had been instructed to light all the lamps, but to extinguish such of them as he might think fit at an earlier hour than usual so long as the short supply of coal continues.

The Leeds Corporation Gas Committee and Water Gas.—The Leeds Corporation Gas Committee left home last Thursday in order to inspect the carburetted water-gas plants at the Crystal Palace District Gas-Works and at Brighton. Should their inspection prove satisfactory, they intend adopting the system at the Meadow Lane works, where there is ample space for the erection of plant capable of producing 2½ million cubic feet per day. While in the Metropolis, the Chairman of the Gas Committee (Alderman Lowden), the Deputy-Chairman (Dr. Heald), and the General Manager (Mr. R. H. Townsley) proposed to pay a separate visit to a second London gas-works, where a Maxim carburetter is in use. At Sheepscar, some difficulty has for a long time been experienced in keeping up the gas to the required standard of 18-candle power; but it is hoped to overcome this drawback by employing a carburetter.

The Quality of the Gas at Leeds.—The Gas Examiner of Leeds (Mr. C. Buckley) has made his annual report to the Justices of the Peace. He states that the gas manufactured in different parts of the city was tested at the various testing-stations provided by the Corporation 616 times, and the number of times the gas was below the standard of 18 candles was 141. The average illuminating power of the gas at each testing-station during the year was: York Street 18·23, Sheepscar 17·87, Kirkstall 18·06, Wortley 18·02, and Dewsbury Road 18·06. The general average for the year was 18·04 candles. This, compared with the previous year, shows a very slight decrease in the illuminating power of the gas; the average for 1898 having been 18·09 candles. The number of times the gas was below the standard of 18 candles at each testing-station was: York Street 18, Sheepscar 58, Kirkstall 13, Wortley 25, and Dewsbury Road 27.

Rawtenstall and the Bury Joint Water Board.—At a meeting of the Rawtenstall Town Council last Thursday, it was decided to join the Bury and District Joint Water Board now being formed. Hitherto the Council have stood aloof from the proposal to form a Board to take over the Bury Corporation Water-Works; but now all the authorities in the water-supply area have agreed to it.

The Port Elizabeth Gas-Works Flooded.—The position of Mr. W. Arnott, the Manager of the Port Elizabeth Gas-Works, is not just now a particularly enviable one. After a spell of dry weather, the rain which had been so eagerly looked for came on the 9th ult.; and, as usually happens, it fell in rather too plentiful quantities. A great thunderstorm burst over the town about 11 p.m., and continued for more than a couple of hours. Roads and pavements were torn up, tram-lines obstructed, and houses flooded. In one street the gas and water mains were undermined, and a recently laid composition pavement was broken up and shifted in blocks a yard square—holes 3 or 4 feet deep being made underneath it. At the gas-works, there was about 2 feet of water; and some anxiety was necessarily felt. Mr. Arnott, however, and all the men available were upon the spot as soon as the water collected; and by their exertions they were able to keep up the fires, and adopt precautionary measures to prevent the town from being left in darkness. The rain was really too heavy and too local to do the country much good. But on the succeeding night it came down in a steadier and more refreshing manner. Mr. Arnott was consequently relieved of his terror of water; but unfortunately there is an ever-present one of a rather more serious nature. During the excitement caused by the war, there is fear of the Dutch rising round Grahamstown; and so the gas-works have to be kept under lock and key, with a guard always on the premises.

Gas-Works Borrowing Powers and the Price of Gas at Milton-next-Sittingbourne.—At a recent meeting of the Milton District Council, the Clerk read a letter from the Local Government Board with reference to the borrowing power of the Council for gas-works purposes. It informed the Council that their Provisional Order gave them a borrowing power of £3000, of which the sum of £2150 had been taken up, leaving £850 as the margin of borrowing power. The Board stated that a fresh Provisional Order could be issued to extend their borrowing power, but not during the present parliamentary session. The Chairman subsequently presented a report by the Gas Committee, showing the financial position in which the Council stood with regard to the gas-works up to date. There was, he said, in the hands of the Treasurer a balance in favour of the works amounting to £181 8s. 10d.; and there were bills awaiting payment amounting to £688. With the balance in hand, the amount outstanding, and the sale of residuals, it was contended that the Council could reckon upon a total of £421, which left a balance of £267 still owing. He thought that the time had come when a loan should be taken up in order to put the works into a more efficient state. He concluded by proposing that the price of gas should be raised 5d. per 1000 cubic feet, and that at the end of every half year £100 should be placed to the reserve fund. After a long discussion, an amendment was carried that the price be raised 3d. per 1000 feet.

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Suffocated by Gas.—On the morning of Sunday, the 11th inst., Henry Patterson, 29 years of age, was found dead in his bedroom at his lodgings in Middlesbrough. The gas in the room was turned on.

Gas-Works in the Market.—As it is not often that freehold gas-works come into the market, the attention of our readers may be specially directed to the announcement which appears elsewhere of the intention of Mr. Alfred Richards to carry out, on Tuesday, the 6th prox., the instructions he has received from the Executors of the late Mr. R. Kemp to sell as a going concern the gas-works at Bagshot, Surrey, together with the whole of the distributing plant.

Gas Explosion at Hanley.—Owing to the fracture of a main in Croston Street, Hanley, and the percolation of the gas through the soil into the cellars of one of the houses, a serious explosion took place a few days ago, which was fortunately unattended by loss of life. The occupant of the house, a Mrs. Tracey, went down to the cellars, and on opening the door of one of them the gas was liberated, and was ignited by a fire in the sitting-room. The place was wrecked; but Mrs. Tracey escaped with a few burns.

Settlement of the Gas Question at Rugeley.—The ratepayers of Rugeley, at a recent meeting, passed a resolution authorizing the District Council to oppose the Bill which is being promoted in Parliament by the Gas Company. Happily, opposition has been averted by a friendly, though protracted, discussion yesterday week between representatives of the Directors and the Council. Concessions were made by the former; and they were considered by the Council to be sufficiently satisfactory to render further opposition undesirable.

A De Brouwer Coke-Conveying Plant for Birmingham.—Orders have been received from the Birmingham Corporation by Messrs. W. J. Jenkins and Co., Limited, of Retford, for the installation of complete coke-conveying plant of their make, on the De Brouwer system, for the large new retort-house at Saltley, in which will be erected 52 beds of 8 inclined retorts, each 20 feet in length. There will be two long retort-house conveyors for taking the hot coke as it falls from the retorts, and a cross conveyor at the end of the retort-house to carry the whole of the coke to the coke storing and loading apparatus, which is of the same type as the hydraulic plant for some time in successful use in the older portion of the works.

Barnet District Gas and Water Company.—The accounts of this Company for the half year ending Dec. 31, which will be presented at the ordinary general meeting next Friday, show that the sale of gas produced £9061, and residuals £2470 in that period; the total gas revenue being £11,805. The expenditure amounted to £7636; leaving a balance of £4169 to go to the profit and loss account. The net water revenue was £11,494; and the total receipts were £11,517. The expenditure being £6769, there was a sum of £4748 to be carried to the profit and loss account. The balance on this account amounts to £17,834, out of which the Directors recommend the declaration of a dividend (less income-tax) at the rate of 9 per cent. per annum on the "A" and "C" stocks, of 8 per cent. per annum on the "B" stock, and of £6 6s. per cent. per annum on the "D" capital (gas and water).

Opposition to the Welsh Water Scheme for London.—Last Wednesday, the Parliamentary Committee of the Glamorgan County Council had a meeting to consider the London Water (Welsh Supply) Bill. Since the initiation of the scheme, the Council have watched it with an unfavourable interest; and the Committee decided to recommend the Council to petition against the Bill. The grounds of objection are general in character, and, briefly, are that Londoners are intruding for the purpose of taking away from the Welsh watersheds water which ought to be reserved for Glamorgan and other parts of Wales.

Incandescent Gas Lighting in Plymouth and East Stonehouse.—So successful has been the application of incandescent lighting to some of the thoroughfares of Plymouth, that an early and large extension of it is promised. In the meantime, it is being taken up in the neighbouring township of East Stonehouse. By an arrangement with the Plymouth and Stonehouse Gas Company, the main streets are to be immediately lighted by incandescent lamps. The understanding is that when the electric light is available, the road between Plymouth and Devonport will be lighted with electric arc lamps. The displaced incandescent gas-lamps will then be fitted in other parts of the district.

The Cardiff Corporation and the Gas Company.—According to what transpired at the recent half-yearly meeting of the Cardiff Gas Company, there is a possibility of the question of the acquisition of the Company's undertaking by the Corporation being reopened. The Chairman (Mr. C. H. Williams) stated that the Corporation had asked the Directors to commence negotiations; but the Board had declined to do so, as they felt they could not be put into the position of negotiators, seeing that they, and the shareholders generally, were well satisfied with their investment. Of course, if the Corporation were anxious to take over the concern, and would make a proper offer, the Directors would give the question their careful consideration. Dr. Taylor (one of the Directors) said he gathered from the papers that some misapprehension existed in the Corporation Committee in regard to the refusal of the Directors to negotiate. He wished some of the members of the Corporation had been present among the shareholders to hear what the Chairman had stated.

Shrewsbury Water Scheme.—From all appearances, Shrewsbury will have to wait some time longer before the inhabitants secure an improved water supply. Dealing with the question at the meeting of the Town Council yesterday week, Alderman G. B. Lloyd said the latest scheme was an upland one for obtaining water from Batchcott, Church Stretton. It was estimated to cost £155,000. Within the last few days, the Council had had a communication from the Local Government Board urging them to get a better supply than the one they had at present; but the Finance Committee had been considering how far the borough could afford the one last proposed, and had come to the conclusion that it was impossible for them to undertake it, at any rate within the next five years. Mr. T. P. Deakin (Chairman of the Water Committee) said it was of the most vital importance to the borough that it should have a better supply. He proposed that the Finance Committee be requested to report as to what sum the Council can be advised to expend at the present time on a new water scheme. This was agreed to.

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A Gas Manager Charged with Embezzlement.—Mr. W. J. Latchford, formerly Manager and Secretary of the Broadstairs Gas Company, has been charged with embezzlement; his defalcations amounting, it is alleged, to about £1000. He has been remanded on bail.

Part of Guildford in Darkness.—Guildford felt the effects of the floods with which the country was visited last week. On Friday, the lower part of the town was in darkness owing to the fracture of a gas-main; and as the electric light works were submerged, this service had to be suspended.

The Cambridge Town Council and the South Essex Water Bills.—At the meeting of the Cambridge Town Council last Thursday, the Parliamentary Committee were authorized to watch the South Essex Water and South Essex Water Board Bills, and to take such steps as may be necessary to oppose them in the interests of the Corporation.

The Sale of Sulphate of Ammonia in America Last Year.—According to an article on "The American Chemical Trade in 1899" in the current number of the "Chemical Trade Journal," "sulphate of ammonia (gas liquor) was very active, and prices were the highest for a long time past. The consumption has steadily increased, and the domestic production was enlarged by the operation of several new bye-products coke-oven plants. In January deliveries were made at $2·70 to $2·77½ per 100 lbs. for 24 to 25 per cent. liquor—an advance of 22c. to 38c. per 100 lbs. over the same month in 1898. Bone sulphate of ammonia was quoted at $2·60 to $2·65, against $2·25 to $2·45 per 100 lbs. in January, 1898. The shipments from Great Britain in the eleven months ending Nov. 30 were approximately 6874 long tons—showing an increase over the year 1898."

Heysham Water Supply.—Last Tuesday, Mr. R. A. Bicknell, one of the Inspectors of the Local Government Board, held an inquiry at Heysham into an application by the District Council for sanction to borrow £5500 for works of water supply. The Clerk to the Council (Mr. Bates) said the Lancaster Corporation supplied Morecambe with water, and the latter entered into an agreement with the Lancaster Rural District Council to supply the parish of Heysham at 1s. 6d. per 1000 gallons, provided the consumption exceeded 800,000 gallons. It had always been above that figure, so that the price was as low as they could possibly get it. The agreement was to continue in force until March 24, 1901, unless in the meantime Heysham should obtain a direct supply from the Lancaster Corporation. The Rural District Council on Oct. 25, 1898, entered into an agreement with the Corporation to supply water direct to Heysham at 8d. per 1000 gallons. Of course, this agreement was subject to the sanction of the Local Government Board. So that really the present scheme was entered into by the Lancaster Rural District Council, and the Heysham District Council were simply carrying it out. The Inspector asked if these people could give notice to terminate the agreement. The Clerk replied that they could not. The Inspector said the Local Government Board would not sanction the application to borrow the money for 30 years if the Council were to be cut off at any time; but if they had an agreement with the Lancaster Corporation for a fixed period, he thought they would do so.

Opposition to the Exmouth Water Company's Bill.—At a meeting of the ratepayers of Budleigh Salterton last Thursday, the action of the District Council in opposing the Bill of the Exmouth Water Company was unanimously approved. Mr. W. Kempson, Chairman of the District Council, said they had consulted Mr. A. J. Martin, of Exeter, who had made a survey of the ground proposed to be enclosed and of the streams which would be affected by the proposed works of the Company. If the promoters of the Bill attained their object, the effect would be that the brook, which was a pleasant characteristic of Budleigh Salterton, would become a dry ditch and a veritable eyesore. From a sanitary point of view, the question was a serious one, for the main sewer was now flushed when necessary from the brook, and if the supply were cut off, water which they could ill afford would be taken from the town mains for this purpose. The East Budleigh Parish Council have also decided to petition against the Bill. The St. Thomas's Rural District Council have appointed a Committee to watch the proceedings, one of the grounds of their hostility being the proposal to enclose 13 acres of common land for the construction of a reservoir.

At a meeting of the Smethwick Town Council last Tuesday, it was decided, on the recommendation of the Gas Committee, to increase the salary of Mr. B. W. Smith, the Gas Engineer, by £25 per annum.

The Davis Gas-Stove Company have abandoned the idea they had some time ago of erecting a foundry in the Falkirk district, and have purchased Springfield Foundry, Falkirk, from Messrs. Cockburn and Co., ironfounders there, and will shortly occupy the works.

The Southwark and Vauxhall Water Company notify a further issue of their 3 per cent. debenture stock, redeemable at par 25 years from the date of issue. The Company's gross revenue from water-rents, &c., as shown by the balance-sheets for the year ended September last, was £289,700, against £214,397 ten years ago.

At the Mart, Tokenhouse Yard, E.C., next Thursday, Mr. Alfred Richards will offer for sale, by order of the Directors, £9000 of 5 per cent. preference stock of the Hornsey Gas Company, and, under instructions from Executors, stock and shares in the Lea Bridge and West Ham Gas Companies and the Bournemouth Gas and Water Company.

Mr. E. H. Stevenson has recommended the Ashford District Council to make additions at their gas-works to the boilers, exhausters, scrubbers, and the buildings connected therewith, and to apply to the Local Government Board for sanction to borrow a sum of £6000 for the purpose. The Council have resolved to defer the matter until the question of the finances of the department has been investigated.

The "Ironmonger" gives currency to the report that the electrical works at Göttingen have now begun to sell the Nernst electric lamp to the trade. This is the first time that the lamp has been offered to the public. The lamps are delivered to customers on hire only at 6d. per month, with a spirit apparatus for lighting, as self-lighting lamps cannot as yet be sent out. These lamps, which were described in the "JOURNAL" for Feb. 14 last year, are of 25 normal candle power.

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The Malvern District Council have entrusted Messrs. W. J. Jenkins and Co., Limited, of Retford, with a contract for the erection of ten beds of inclined retorts complete with all ironwork, brickwork, and machinery for unloading waggons, breaking and elevating coal, and dealing with the coke. The whole of the plant has been designed by Mr. H. P. Maybury, the Gas Engineer to the Council, under whose instructions the work will be executed.

Some of our readers may be interested in a series of six lectures on "Petroleum: Its Production and Treatment," which Dr. Paul Dvorkovitz will commence to-morrow evening at the City and Guilds of London Technical College, Leonard Street, City Road. He will deal first with the history of petroleum, and next with its origin and geology; he will describe the principal systems of drilling, and explain the physical and chemical constitution of petroleum and the method of distilling and refining it. The final lecture will be devoted to its utilization. Dr. Dvorkovitz being one of the first authorities on this subject, his lectures should embody all that is worth knowing thereon.

Messrs. C. Isler and Co. have recently completed the following artesian-bored tube wells: At Messrs. Vickers, Son, and Maxim's, Limited, at Erith, a 20 inch well, 250 feet deep, through chalk and flints, yielding over 40,000 gallons of water per hour, continuous pumping. The same results have been obtained from a 13½-inch well, sunk 170 feet deep, at the Berkhamsted Water-Works. The firm fixed some years ago a complete installation at Hatfield, for the supply of the town, by command of Lord Salisbury. This first installation having given satisfaction, they have received orders for a larger plant to be installed to enable a more copious supply to be obtained. The yield has proved to be equal to expectations; and the work will be completed shortly. The depth of the bore-hole is 304 feet from the surface. Artesian wells have also been sunk for Spratt's, Limited, at their new premises in Poplar, to the depth of 350 feet.

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JOSEPH TAYLOR & CO., Chemical Plumbers, &c., and Makers of every description of Solid Plate Lead and Timber Cased Saturators, &c., CENTRAL PLUMBING WORKS, TOWN HALL SQUARE, BOLTON. Special attention to Repairs.

Before placing Orders, please write for Estimate.
Telegraphic Address: "SATURATORS, BOLTON."

J. & J. BRADDOCK (Branch of Meters Limited), Globe Meter Works, OLDHAM; and 45 & 47, Westminster Bridge Road, LONDON, S.E.

First-Class Award, Melbourne Exhibition, 1889, for WET AND DRY GAS-METERS, STATION METERS, AND GOVERNORS, PRESSURE-GAUGES, STREET LAMPS AND PILLARS, &c.

Telegraphic Addresses:
"Braddock, Oldham." "Metrique, London."

SULPHURIC ACID.

JOHN NICHOLSON & SONS, Limited, Chemical Works, Leeds, specially produce this ACID from SULPHUR, for making SULPHATE OF AMMONIA of high quality and *good* colour. Delivery in our own Railway Tank-Wagons or Carboys. Highest references and all particulars supplied on application.

NEW GAS PLANT CEMENT.

JOHN E. WILLIAMS AND CO.,
VICTORIA PAINT WORKS,
MANCHESTER.

For all Joints in connection with Oil-Gas Plant and Sulphate Plant.
For all Gas Joints.
For all Tar Joints.
For all Ammonia Joints.

GAS TAR wanted.

BROTHERTON AND Co, Tar Distillers. Works: BIRMINGHAM, LEEDS, and WAKEFIELD.

WANTED, a good all-round Gas-Fitter.

One trained on a Gas-Works preferred.

Apply, with *copies* of Testimonials, stating Age and Wages required, to the MANAGER, Gas-Works, UTTOXETER.

DRAUGHTSMAN wanted, conversant with Chemical and Gas Plant.

State Age, Experience, and Salary required to C. & W. WALKER, LIMITED, Donnington, near Newport, SHROPSHIRE.

WANTED, a good Gas-Fitter, well up in Iron and Compo. Work. Preference given to a Married Man, and one able to do rough Smithing Work.

Apply, stating Experience and Wages required, to J. H. CORNISH, Gas-Works, BRIDPORT.

WANTED, by a Gas Company in York-shire, a CLERK about 20 to 25 Years of Age, who has had experience in Gas Office Work.

Apply, stating Age, Experience, and Salary required, to No. 3433, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

WANTED, at once, a steady young Man, for Main and Service Laying, and Meter Fixing and Testing. One with knowledge of Gas-Fitting and Incandescent Lighting preferred. Wages 27s. per week.

Apply, by letter, to No. 3434, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

WANTED, Travellers to push the Sale of GOVERNORS for Street and Incandescent Gas Lighting, on Commission. Must be well connected with Gas Managers.

State which Districts covered, and full Particulars, to No. 3435, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

ENGINEER'S Clerk of Works wanted, by the East Surrey Water Company, to superintend the construction of a new Pumping-Station, Reservoirs, &c.

Apply, by letter, stating Age, Experience, and Salary required, and enclosing *copies* of three recent Testimonials, to J. R. DOWNES, C.E., Redhill, SURREY.

WANTED, a Gentleman of good address to represent a Gas Trades Apparatus Manufacturing Company in the Northern and Midland Counties of England. One who has a knowledge of the Gas Trade, or can undertake the extra work with an existing connection preferred.

Apply, by letter, to No. 3431, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

TO GAS MANAGERS.

WANTED, a Manager for a 25 Million Cubic Feet Gas-Works. Good Carbonizer, able to control Workmen, Superintend Sulphate Manufacture and Gas-Fitting Department, attend Consumers and keep Books by Double Entry. Salary £175-£200. Excellent opportunity for capable Man.

Apply, by letter, before the 24th inst., giving full details as to present and past Engagements, *copies* of recent Testimonials, when disengaged, &c., to No. 3430, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

GAS PURIFICATION.

OXIDE OF IRON BOG ORE.

BALE & CO.'S Oxide of uniform quality. SPECIAL FIRE CEMENT, OXIDE PAINTS, OILS, SULPHURIC ACID, &c.

120 and 121, NEWGATE STREET, LONDON, E.C.
Telegrams: "BOGORE, LONDON."

SADLER & CO., Ltd., Middlesbrough, Tar Distillers and Tar Colour Manufacturers. BENZOL specially prepared for Gas Enrichment free from Sulphur. Pure Hydrated OXIDE OF IRON for Purifying Gas either for Sale or Lent on Hire. Always Buyers of GAS TAR and AMMONIACAL LIQUOR.

CANNEL, COAL, ETC.

JOHN ROMANS & SON, EDINBURGH, Gas Engineers, supply all the most approved SCOTTISH CANNELS; also FIRE-CLAY GOODS, CAST-IRON PIPES, and other APPARATUS for GAS and WATER WORKS.

Prices, &c., will be forwarded on application
No. 30, ST. ANDREW SQUARE, EDINBURGH, } SCOTLAND.
NEWTON GRANGE, NEWBATTLE, DALKEITH, }

REQUIRED, at once, a Junior Clerk for a well-established Gas Company in one of the Northern States of Brazil. Age about 21. Three Years' Engagement. Passage out and home free.

Apply, by letter only, in the first instance, stating Qualifications, Salary expected, and Employment for last three Years, and enclosing *copies* only of three recent Testimonials, to No. 3432, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

CAMBRIDGE UNIVERSITY AND TOWN WATER-WORKS, COMPANY.

WANTED, a Draughtsman and Clerk.

Apply, stating Salary required, Age, previous Experience, and enclosing two original Testimonials as to Ability and Character, on or before the 6th of March next.

WM. W. GRAY,
Engineer and Manager.
4, Benet Street, Cambridge,
Feb. 13, 1900.

THE DERWENT VALLEY WATER BOARD

APPOINTMENT OF ENGINEER.

BY the Derwent Valley Water Act, 1899, the Derwent Valley Water Board are authorized to construct six large Reservoirs in the Valleys of the Derwent and the Ashop in Derbyshire, together with important subsidiary Works in connection therewith to deal with an estimated flow of Fifty Million Gallons of Water per day. The Reservoirs will be constructed successively; and the execution of these and the other authorized Works is expected to occupy many Years.

Applications are now desired for the position of ENGINEER to the Board. The Engineer will be responsible for the Designing and Construction of the Works. He will be required to reside in the neighbourhood of the Works, and to devote the whole of his time to his duties under the Board, and to have daily personal charge of the work in hand. The staff of Assistants, Inspectors, Draughtsmen, Clerks, and others necessary in the carrying out of the work will be provided by the Board, and be under the direction of the Engineer.

The engagement will (subject to the services rendered being satisfactory) be certainly until the first two Reservoirs are completed (this work it is estimated will take some Ten Years to carry out), and may be a permanent one. The Engineer on his part will be required to enter into an agreement to remain in the exclusive service of the Board until the first two Reservoirs are completed. The Board reserve the power of determining the engagement with the Engineer on giving him Six Months' Notice, in case his services are not considered satisfactory.

It is indispensable that Candidates for the appointment should have had considerable experience in designing and constructing Reservoirs and Gravitation Water-Works.

The Board reserve the right (which they will probably exercise) to appoint, or take the opinion of, a Consulting Engineer or Consulting Engineers on the Works, when and as desired.

Each Applicant must furnish at least two References and *copies* of Testimonials (which cannot be returned, and which preferably should be printed); the Board having the right to call for the production of the originals.

Applicants must state Age, Experience, Present Position, Salary required, when at Liberty, and general state of Health. Personal Canvassing will be a disqualification.

Communications to be sent to me not later than the 10th day of March, 1900, marked on the outside "Derwent Valley Engineer."

JAMES BELL,
Clerk to the Board.
Rowton Buildings, Bowling Green Street,
Leicester, Jan. 17, 1900.

GAS LIGHTING SPECIALITIES.

APPLICATIONS are invited for the post of GENERAL MANAGER at large Works in Provincial Town. Must take entire charge of all Departments. Commencing Salary £250 per annum, and Commission. None but experienced Men need apply.

For further Particulars address S.L., care of STREET'S AGENCY, 30, CORNHILL, E.C.

BOROUGH OF BRIGHOUSE.

THE Gas Committee of the Corporation require the services of a Competent GAS-METER INSPECTOR and FITTER, used to Lead and Iron Piping. The Wages will be 30s. per week, no allowance for overtime.

Applications, stating Age, Experience, present Employment, and accompanied by not more than two Testimonials, to be delivered at the Town Clerk's Office, on or before the 27th inst., endorsed "Meter Inspector."

JAMES PARKINSON,
Town Clerk.

Town Clerk's Office, Municipal Offices,
Brighouse, Feb. 13, 1900.

WANTED, the whole of the Ironwork of a Bench of three 15-inch Round Retorts, second hand.

Apply to the SECRETARY, Gas-Works, OKEHAMPTON.

TO BUYERS OF SPENT OXIDE.

WANTED, Names of Firms willing to purchase Spent Oxide.

Apply, by letter, to No. 3424, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

WANTED, a good second-hand Station METER, 15,000 cubic feet per hour capacity, with 12-inch Connections.

Apply, with full Particulars, to

BENJAMIN BARK.

Gas-Works, Godalming.

FOR SALE—A 60-inch Letheby-Bunsen PHOTOMETER, and complete TESTING APPARATUS for Sulphur and Ammonia. All new in 1895.

Apply to H. MATTHEWS, Gas Examiner, CHELTENHAM.

FOR SALE—Two good Exhausters, to pass 5000 cubic feet per hour (Waller's), with Engines and Boiler complete. No reasonable offer will be refused.

GEORGE LANE, Manager, Gas-Works, AYLESBURY.

ENGINES and Exhausters, from 1500 to 30,000 cubic feet per hour, in Stock, ready for delivery. No reasonable offer refused.

J. F. BLAKELEY, Thornhill, DEWSBURY.

LIVESEY Washer, 1 Million per diem, 18-inch Valves. MORRIS & CUTLER'S CONDENSER, 18-inch Valves. All in perfect order, and cheap.

J. F. BLAKELEY, Thornhill, DEWSBURY.

GAS PLANT for Sale—I can always offer NEW and SECOND-HAND GAS APPARATUS, including Retorts and Fittings, Condensers, Exhausters, Scrubbers, Washers, Purifiers, Gasholders, Tanks, Valves, Connections, &c. Also a few COMPLETE WORKS. Compare Prices and Particulars before ordering elsewhere.

J. F. BLAKELEY, Gas Engineer, Thornhill, DEWSBURY.

RICHMOND GAS COMPANY.

FOR SALE—A Second-hand Two-Lift GASHOLDER of about 120,000 cubic feet capacity, with Column Guide-Framing and Cast-Iron Tank complete. Can be seen at the Richmond Gas-Works.

Offers for the whole as it stands to be addressed to

THOMAS MAY,
Engineer and Secretary.

Feb. 15, 1900.

COUNTY BOROUGH OF BOLTON.
(GAS DEPARTMENT.)

THE Gas Committee of the above Corporation invite TENDERS for the purchase of the TAR to be produced at their Gas-Works during the Year ending the 31st of March, 1901.

Further Particulars, and Form of Tender, may be obtained on application to Mr. William Walch, Office Superintendent, Gas Offices, Bolton.

Sealed Tenders, endorsed "Tender for Tar," and addressed to Alderman Miles, Chairman, should reach the Gas Offices, Bolton, not later than Thursday, the 1st of March.

R. G. HINNELL,
Town Clerk.

Town Hall, Bolton,
Feb. 16, 1900.

THE Perth Gas Commissioners are prepared to receive TENDERS for the following Apparatus, to be erected at the New Gas-Works, Friarton, Perth, viz.:—

Section I.—12-inches Diameter PIPE CONDENSER.
Section II.—PURIFIERS, LIFTING APPARATUS, and PIPING.
Section III.—GAS EXHAUSTERS and STEAM-ENGINES combined.

Copies of the Specification may be obtained from A. Gillespie, Consulting Engineer, 34, St. Enoch Square, Glasgow, at whose Office the Drawings can be seen. Blue Prints for Sections I. and II. will be sent to intending Contractors by the Engineer, on receipt of 10s.

Tenders are to be sealed and endorsed, and to be delivered to Mr. John Begg, Clerk to the Gas Commissioners of Perth, on or before Saturday, the 3rd of March, 1900.

WASHER-SCRUBBER.

THE Tynemouth Gas Company invite TENDERS for the supply and erection of a SCRUBBER-WASHER at the Gas-Works, North Shields.

Particulars from the undersigned.

W. HARDIE,
Engineer.

Gas-Works, North Shields,
Feb. 13, 1900.

BOROUGH OF BLACKPOOL.

THE Gas Committee are prepared to receive TENDERS for the making and erection of a STEEL RETORT-HOUSE ROOF, 260 ft. by 65 ft. span, at their new Gas-Works.

Plan, Specification, and Particulars for inspection at the Offices of the Gas Engineer.

Endorsed Tenders to be sent to the Chairman of the Gas Committee, not later than Saturday, Feb. 24.

By order,
JOHN CHEW,
Gas Engineer.

Gas Offices, Princess Street,
Blackpool, Feb. 9, 1900.

CORPORATION OF CLITHEROE.

TENDERS FOR TAR AND LIQUOR.

THE Gas Committee invite Tenders for their surplus TAR AND AMMONIACAL LIQUOR for Twelve Months from the 25th of March next. Delivery on Gas-Works Siding into Purchaser's Tanks.

Sealed Tenders, endorsed "Tender for Tar, &c.," to be sent to the Chairman of the Gas Committee, not later than Tuesday, the 27th day of February, 1900.

ROBT. BARRETT,
Manager.

Clitheroe, Feb. 15, 1900.

RAMSGATE CORPORATION.
(GAS DEPARTMENT.)

TENDERS FOR TAR.

THE Gas and Water Committee invite TENDERS for the surplus TAR (150,000 Gallons or thereabouts), to be made between the 1st of April, 1900, and the 31st of March, 1901.

Tenders to be returned on or before March 10, addressed to the Chairman of the Gas and Water Committee, Boundary Road, Ramsgate, and endorsed "Tender for Tar."

The Committee do not bind themselves to accept the highest or any Tender.

Full Particulars on application to

WILLIAM A. VALON,
Engineer.

SHEFFIELD UNITED GASLIGHT COMPANY.

TO ENGINEERS AND IRONFOUNDERS.

THE Directors of this Company invite TENDERS for the supply and erection of IRON and STEEL WORK required in the construction of Fifteen Settings of Ten Retorts each at their Grimesthorpe Works, as follows: Buckstaves, Cross Girders, Ascension, Arch, and Dip Pipes, Hydraulic Mains, Gas and Tar Mains, &c., 300 Retort Mouthpieces, with Self-Sealing Lids, and about 840 lineal feet of 30 inches and 36 inches diameter Steel Foul Mains, and Wall Brackets, Suspenders, &c.

Specification, Quantities, and Forms of Tender may be obtained from the Company's Engineer, Mr. J. W. Morrison, on and after the 22nd inst.

The Directors do not bind themselves to accept the lowest or any Tender.

Sealed Tenders, marked "Tender for Retort-Fittings, &c.," must be delivered to the undersigned, by post, not later than the first post on Saturday, March 3, 1900.

HANBURY THOMAS,
General Manager and Secretary.

Commercial Street, Sheffield,
Feb. 17, 1900.

MANCHESTER CORPORATION GAS-WORKS.

TO OIL IMPORTERS AND OTHERS.

THE Gas Committee of the Corporation of Manchester are prepared to receive TENDERS for the supply of 20,000 Tons of OIL suitable for the Manufacture of Carburetted Water Gas.

The Oil to have a Flashing-Point of not less than 73° (Abel's Test), and not less than any higher degree of temperature which may be specified in any future Act of Parliament, or Regulations to be made thereunder.

Full Description, with Analysis of the Oil offered, must be submitted with each Tender, as well as a sealed sample of the same.

The Oil to be delivered free of all charges (including Ship Canal dues) into the Storage Tanks of the Corporation at Trafford Wharf on the Banks of the Manchester Ship Canal, in such quantities as may be from time to time required by the Gas Committee, during the period of Two Years ending on the 31st of March, 1902.

Tenders to be at a price per Imperial Gallon.

Further Particulars may be obtained on application (in writing only) to Mr. Charles Nickson, Superintendent of the Gas Department.

Sealed Tenders and Samples, addressed to the Chairman of the Gas Committee, and endorsed "Tender for Gas Oil," must be delivered at the Office of the Superintendent of the Gas Department, Town Hall, Manchester, on or before Monday, the 26th day of March next.

The Corporation do not bind themselves to accept the lowest or any Tender.

By order of the Gas Committee,
WM. HENRY TALBOT,
Town Clerk.

Town Hall, Manchester,
Feb. 18, 1900.

BOROUGH OF BARROW-IN-FURNESS.

THE Corporation are prepared to receive TENDERS for the supply of machine-moulded FIRE-CLAY RETORTS, FIRE-BRICKS, CAST-IRON PIPES, WROUGHT-IRON TUBES and FITTINGS, BRASS COCKS, GAS-METERS, and SULPHURIC ACID as may be required from the 1st day of April next to the 31st day of March, 1901.

Sealed Tenders, on Forms to be obtained at the Office of the Manager of the Gas and Water Works, addressed to the Chairman of the Gas and Water Committee, and endorsed "Tender for Stores," to be delivered at the Town Clerk's Office on or before Tuesday, the 27th inst.

The lowest or any Tender not necessarily accepted.

By order,
C. F. PRESTON,
Town Clerk.

Town Hall, Barrow-in-Furness,
Feb. 9, 1900.

BOROUGH OF BEVERLEY.

THE Gas Committee are prepared to receive TENDERS:—

No. 1 CONTRACT.—For TELESCOPING present 100 feet diameter HOLDER.
No. 2 CONTRACT.—For a STATION METER.

Plans may be seen on application to Mr. James Gibson, the Gas Manager; and Specifications may be obtained from him on payment of £1 1s., which will be returned upon receipt of a *bonâ-fide* Tender.

Tenders, endorsed "Tender for Gasholder" or "Tender for Station Meter," as the case may be, must be sent to the undersigned on or before Wednesday, the 28th of February, 1900.

The Committee do not bind themselves to accept the lowest or any Tender.

By order,
J. WILLIS MILLS,
Town Clerk.

Beverley, Feb. 15, 1900.

DARWEN CORPORATION.
(GAS DEPARTMENT.)

TENDERS FOR FIRE-CLAY, RETORTS, BRICKS, &c.

THE above Corporation are prepared to receive TENDERS for the supply of FIRE-CLAY, RETORTS, BRICKS, &c.

Forms of Tender and all Information as to quantities may be obtained on application to Mr. A. H. Smith, Gas Engineer, Darwen.

Sealed Tenders, endorsed "Fire-Clay, Retorts, &c.," must be delivered to the undersigned at or before Noon on Monday, Feb. 26, 1900.

No Tender necessarily accepted.

By order,
CHAS. COSTEKER,
Town Clerk.

Town Clerk's Office,
Darwen, Feb. 14, 1900.

BRIGHTON AND HOVE GENERAL GAS COMPANY.

TO THE PROPRIETORS.

NOTICE is Hereby Given, that the ORDINARY HALF-YEARLY GENERAL MEETING of the Proprietors of this Company will be held at the Company's Offices, No. 5, Great Winchester Street, London, on Friday, the 9th of March, 1900, at Two o'clock in the afternoon precisely, to receive the Report of the Directors and the Accounts of the Company for the Half Year ended the 31st of December, 1899, to declare Dividends, to elect a Director, to appoint a Special Auditor, and for other purposes.

And Notice is Hereby Given that, immediately after the conclusion, or adjournment, of the business of the Ordinary General Meeting, a SPECIAL GENERAL MEETING of the Proprietors will be held, at which a Resolution (*a*) will be submitted to the Proprietors, providing that no further action be taken on the Resolution passed at the Special General Meeting held on the 1st of September, 1893; also a Resolution (*b*) will be submitted, authorizing the raising either by the issue of Ordinary Stock or Preference Stock, or partly by the issue of Ordinary and partly as Preference Stock, of the sum of £137,700 18s. 6d. of the Capital authorized to be raised in pursuance of the Brighton and Hove Gas Act, 1893; and a further Resolution (*c*), authorizing the Directors to exercise the Borrowing Powers conferred by the said Act in respect of such issue or issues made, or to be made.

The TRANSFER BOOKS of the Company WILL BE CLOSED from the 24th of February to the 9th of March, both days inclusive.

By order,
ERNEST L. BURTON,
Secretary.

5, Great Winchester Street,
London, E.C., Feb. 16, 1900.

BRIGHTON & HOVE GENERAL GAS COMPANY—£500 ORIGINAL STOCK. Dividend 11½ per cent.

WALTHAM ABBEY AND CHESHUNT GAS COMPANY—£530 FOUR PER CENT. DEBENTURE STOCK.

ST. MARGARET'S (HERTS) GAS COMPANY.—100 £5 SHARES. Dividend 6 per cent.

SOUTHAMPTON GAS COMPANY—£400 ORDINARY FIVE PER CENT. STOCK.

HYTHE AND SANDGATE GAS COMPANY—£10 ORIGINAL SHARES, Dividend 4 per cent.; and £10 FOUR PER CENT. PREFERENCE SHARES.

MESSRS. EDWIN FOX & BOUSFIELD will include in their next STOCK and SHARE AUCTION at the Mart, on Wednesday, March 7, at Two o'clock, in Lots, the above with Shares in other Companies.

Particulars of the AUCTIONEERS, 99, Gresham Street, LONDON, E.C.

SALES BY AUCTION OF GAS AND WATER STOCKS AND SHARES.

MR. ALFRED RICHARDS begs to notify that his AUCTIONS of STOCKS and SHARES in London, Suburban, and Provincial Gas and Water Companies are held PERIODICALLY, at the Mart, Tokenhouse Yard, E.C.

He also undertakes the issuing by AUCTION of GAS and WATER STOCKS and SHARES under Parliamentary Powers.

Terms for issuing such Capital, and also for including Gas and Water Stocks and Shares in these periodical Sales, can be obtained on application at Mr. ALFRED RICHARDS' OFFICES, 18, FINSBURY CIRCUS, E.C.

By order of the Directors of the

HORNSEY GAS COMPANY.

£9000 FIVE PER CENT. PREFERENCE STOCK.

MR. ALFRED RICHARDS will Sell THE ABOVE BY AUCTION, at the Mart, E.C., on Thursday, the 22nd of February, at Two o'clock, in Lots.

Particulars of the AUCTIONEER, 18, FINSBURY CIRCUS, E.C.

Estate of Wm. Boards, Esq., deceased, and Miss Rowley, deceased.

SHARES AND STOCK IN THE

WEST HAM GAS COMPANY,

BOURNEMOUTH GAS AND WATER COMPANY,

LEA BRIDGE DISTRICT GAS COMPANY.

TO BE SOLD BY AUCTION BY

MR. ALFRED RICHARDS, at the Mart, E.C., on Thursday, Feb. 22, 1900, at Two o'clock.

Particulars of the AUCTIONEER, 18, FINSBURY CIRCUS, E.C.

By order of the Executors of the late Mr. R. Kemp.

The FREEHOLD GAS-WORKS, situate at BAGSHOT, SURREY, within a short distance of the Station, and comprising two Gasholders, Retort-House (with ten Retorts), Coal-Store, Condenser, two Purifiers, and Governor-House, together with the whole of the Mains, to be sold as a going concern, and with possession on completion of the purchase.

MR. ALFRED RICHARDS has received Instructions to SELL THE ABOVE BY AUCTION (in conjunction with Messrs. WALKER AND FINN), at the Mart, E.C., on Tuesday, March 6, at Two o'clock precisely.

Particulars of Messrs. REEP, LANE, AND CO., Solicitors, BAGSHOT; of Messrs. WALKER AND FINN, Auctioneers, EGHAM; and of Mr. ALFRED RICHARDS, Auctioneer, 18, FINSBURY CIRCUS, E.C.

SOUTHWARK AND VAUXHALL WATER COMPANY.

SALE BY TENDER OF £100,000 THREE PER CENT. DEBENTURE STOCK.

NOTICE is Hereby Given, that it is the intention of the Directors of the Southwark and Vauxhall Water Company to SELL BY TENDER, to be received at the Company's Office, Southwark Bridge Road, S.E., not later than Twelve o'clock (noon) on Tuesday, Feb. 27, 1900, £100,000 DEBENTURE STOCK OF THE COMPANY.

The Stock now for Sale is the fifth portion of the Capital authorized by, and to be issued under, the Provisions of the Southwark and Vauxhall Water Act, 1894, and will be entitled from March 31, 1900, to Interest at the rate of £3 per cent. per annum. It will be known as Debenture Stock "B," and may be redeemed at par at any time after the expiration of 25 Years from the date of issue, subject to Six Months' previous Notice of the intention to redeem. Debenture Stock "B" will rank for Interest, and otherwise *pari passu*, with the other Debenture Stock of the Company, but before the Ordinary and Preference Stock and Share Capital. It is a lawful investment for Trustees.

For Particulars, Forms, and Conditions of Tender, apply at the Office of the Company, Southwark Bridge Road, S.E.

By order of the Board of Directors,
MONTAGUE WATTS,
Secretary.

Southwark Bridge Road, S.E.,
Feb. 15, 1900.

DEVONPORT WATER COMPANY.

FIFTH ISSUE OF £4 PER CENT. PREFERENCE STOCK TO RAISE £10,000.

FIRST PAYMENT OF INTEREST WILL BE MADE ON THE 29TH OF SEPTEMBER NEXT.

The Company having for more than Ten Years past paid a Dividend of £5 per cent. on its Ordinary Stock, the Preference Stock now offered is, under the Trustees Investment Acts, an available Investment for Trustees who are not expressly forbidden from investing therein by the Instrument (if any) creating the Trust.

THE Directors of the Devonport Water Company are prepared to receive TENDERS for the sum of £10,000, or any part thereof, in sums of £50 and upwards (being multiples of £10), free from all Charges and Expenses.

Tenders, stating the Price per Cent., which must not be below £125 per Cent., should be sent to the Secretary, on or before the 28th of February next.

The Security comprises the Income from Water-Rates and other Sources, which for the past Eight Years have annually exceeded £12,000, and which for the past Year exceeded £15,000.

The Stock to be issued will be entitled to a Preferential Dividend in Perpetuity over the Ordinary Stock.

For a Prospectus giving further Particulars and Form of Tender, apply to the Naval Bank, Plymouth; or to

FOSTER J. BONE,
Secretary.

23, Ker Street, Devonport,
Jan. 29, 1900.

SUNDERLAND AND SOUTH SHIELDS WATER COMPANY.

IMPORTANT SALE OF WATER STOCK.

TO BE SOLD by Auction in the Long Room of the Queen's Hotel, Fawcett Street, Sunderland, on Thursday, Feb. 22, 1900, at Two o'clock in the Afternoon prompt.

MR. ATKINSON GIBSON, AUCTIONEER,

£25,000

Nominal) of the New Stock (Maximum Dividend 5 per cent.) authorized to be created and issued under the powers contained in the Sunderland and South Shields Water Act, 1891.

The above Stock will be entitled to Dividend from the 1st day of January, 1900, and be registered in the name of the Purchaser free of charge.

A deposit of 10 per cent. will be required at the time of Sale; the remainder to be paid on or before the 1st day of March, 1900.

BRENTFORD GAS COMPANY.

SALE BY TENDER OF £46,875 FOUR PER CENT. PERPETUAL DEBENTURE STOCK.

IN pursuance of the Brentford Gas Order, 1881, Notice is Hereby Given, that it is the intention of the Directors of this Company to SELL BY TENDER £46,875 FOUR PER CENT. PERPETUAL DEBENTURE STOCK of the Company, to be paid up in full on or before the 31st day of March; such Stock being a portion of Additional Capital authorized to be raised by Resolutions passed at an Ordinary Meeting of Proprietors held on the 11th day of February, 1898, under the powers of the above-mentioned Order.

Particulars and Conditions of Tender may be obtained on application at this Office, and sealed Tenders must be sent in not later than Twelve o'clock (noon) on Monday, the 12th day of March next.

By order,
WILLIAM MANN,
Secretary.

Office, Brentford Gas Company,
Brentford, Feb. 8, 1900.

PUBLICATIONS

ISSUED BY

WALTER KING,

11, BOLT COURT, FLEET STREET, E.C.

THE VALUATION OF GAS, ELECTRICITY, AND WATER WORKS FOR ASSESSMENT PURPOSES.—Second Edition. By THOMAS NEWBIGGING, M.Inst.C.E., and WILLIAM NEWBIGGING, Assoc.M.Inst.C.E. *Price 5s.*

COMPLETE REPORTS OF PROCEEDINGS OF THE DISTRICT ASSOCIATIONS OF GAS ENGINEERS AND MANAGERS FOR 1899. *Price 5s. 6d., post free.* The Volumes issued since the series commenced in 1883 are still on sale.

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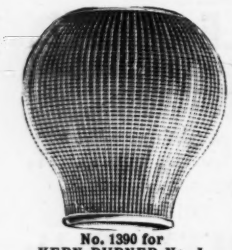

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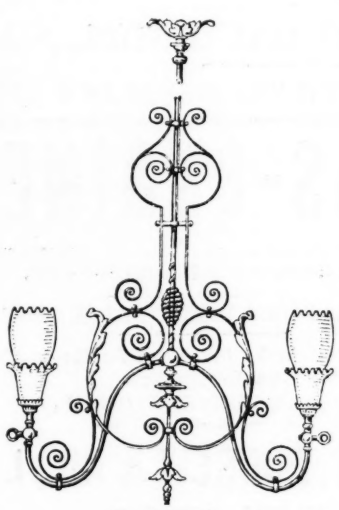

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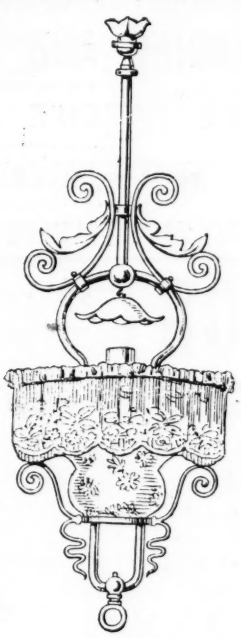

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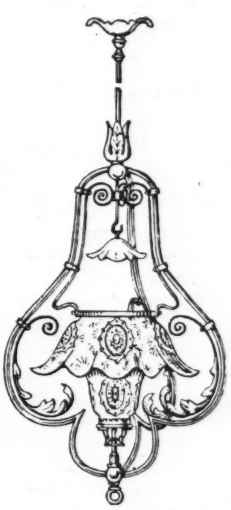

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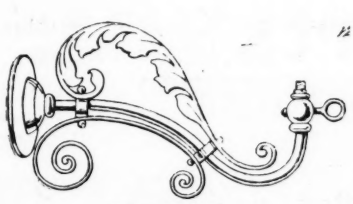

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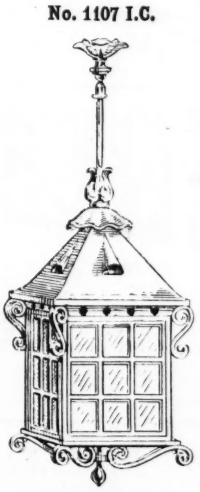

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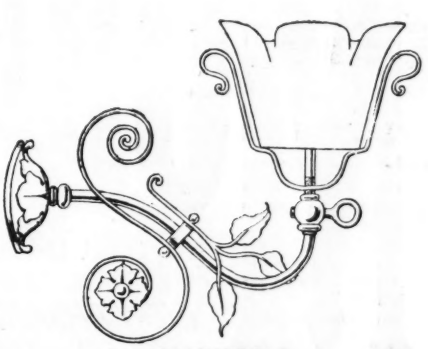

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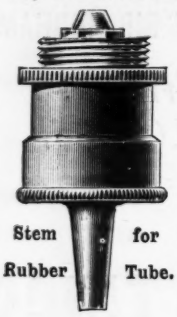

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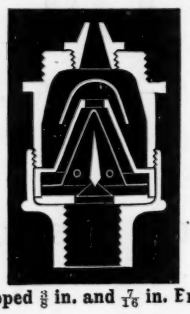

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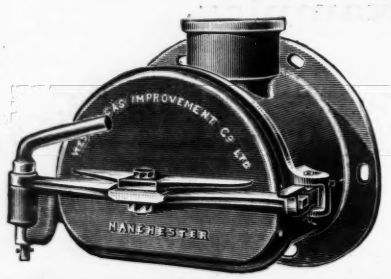

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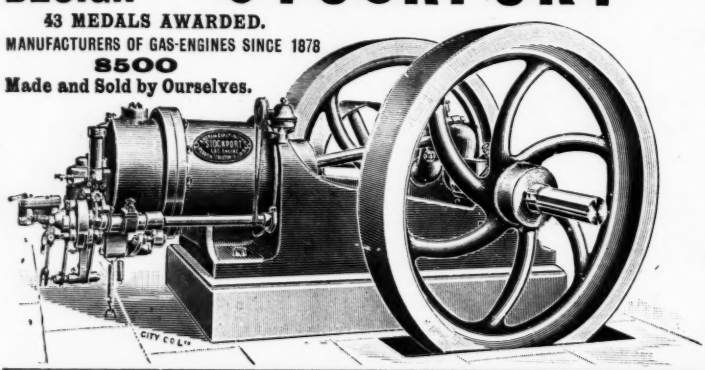

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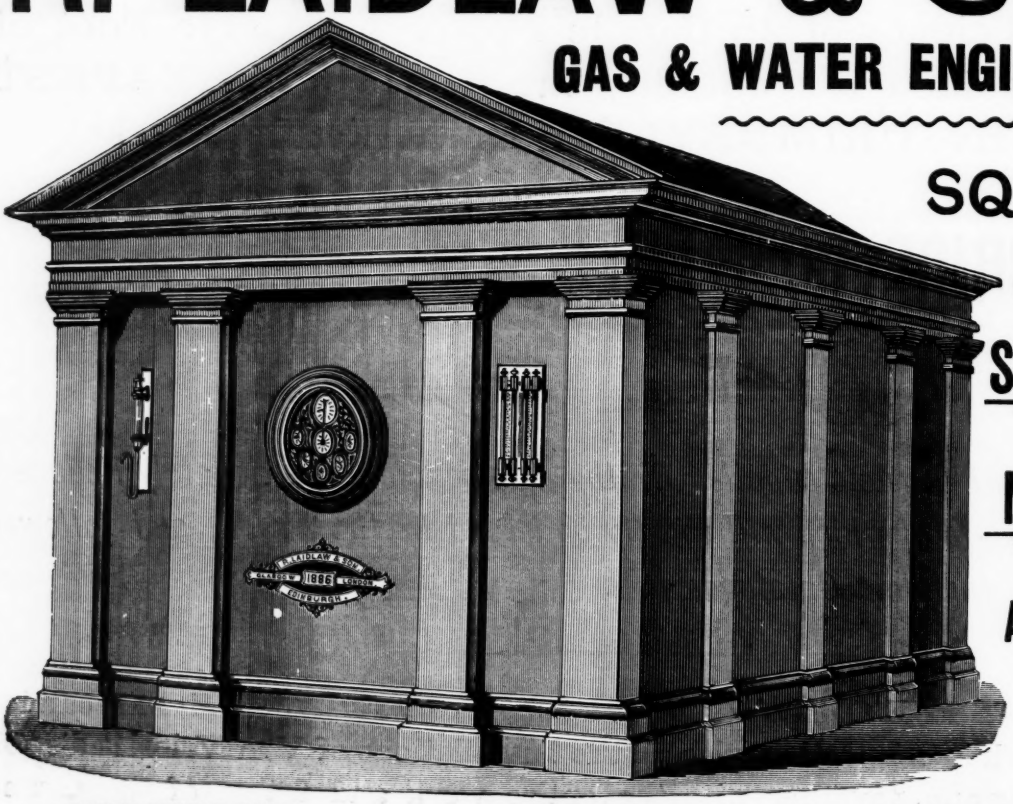

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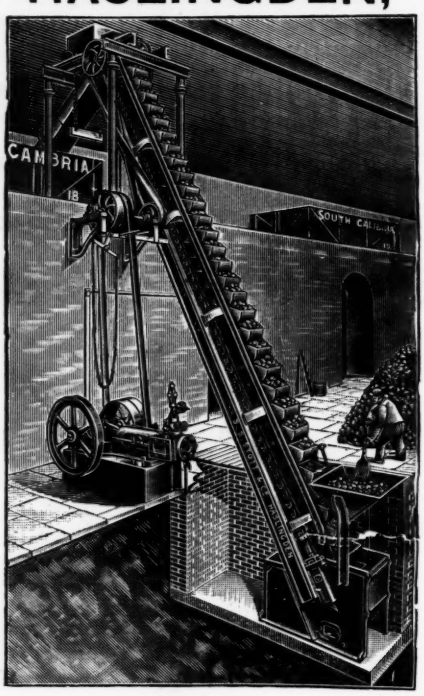

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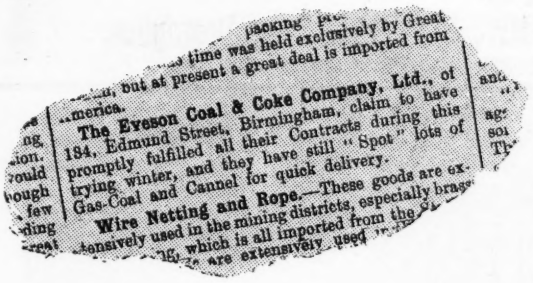

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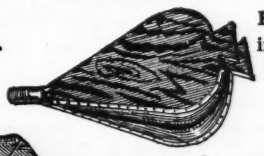

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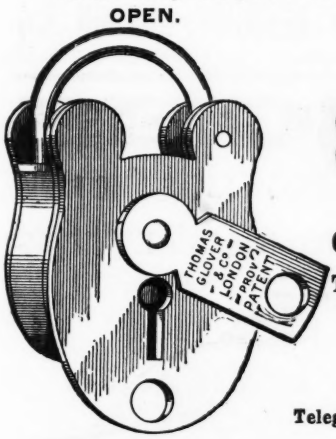

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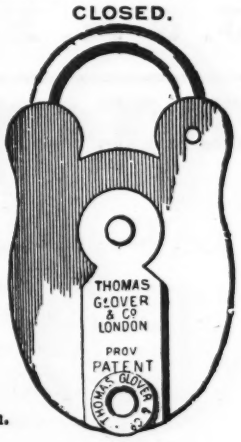

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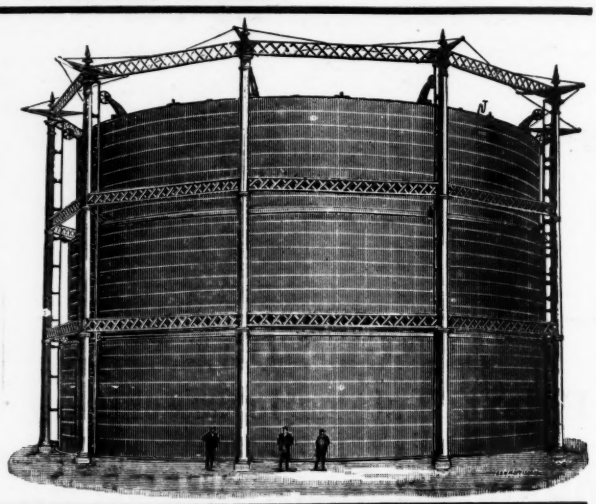

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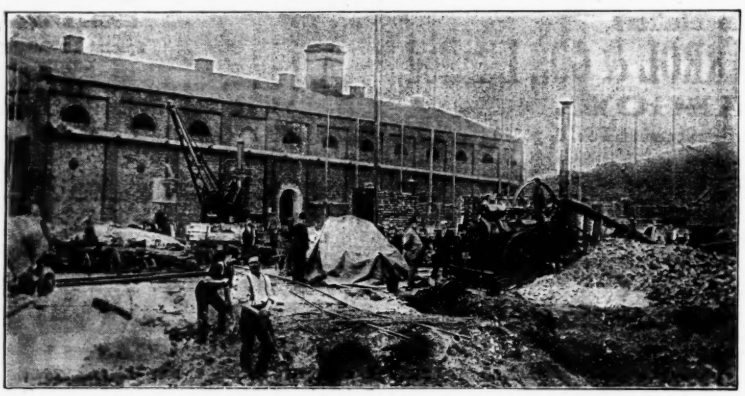

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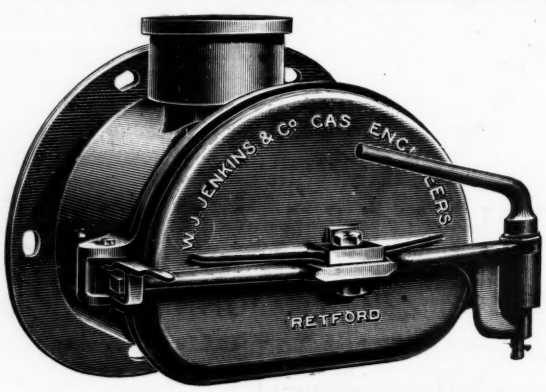

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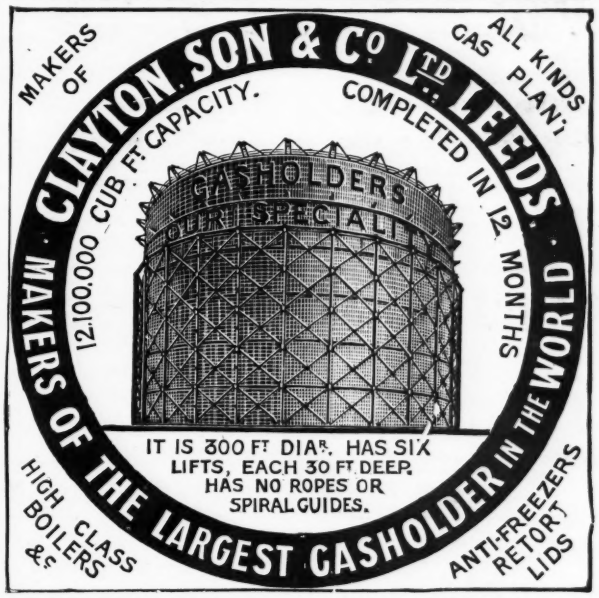
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[See also Advt., p. 456.

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